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Vol. VIII.

**ZOOLOGICAL RESULTS OF THE ABOR EXPEDITION,  
1911-12.**

Part I.

October, 1912.

	PAGE
Introduction .. . . . .	I
I. Batrachia. <i>N. Annandale</i> .. . . .	7
II. Reptilia. <i>N. Annandale</i> .. . . .	37
III. Lepidoptera. <i>W. H. Evans</i> .. . . .	61
IV. Porifera. <i>N. Annandale</i> .. . . .	67
V. Scolopendridae. <i>F. H. Gravely</i> .. . . .	69
VI. Hymenoptera Anthophila. <i>C. A. Paiva</i> .. . . .	75

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Illustrations of the Zoology of the R.I.M.S. "Investigator" 1892. Fishes, Plates I to VII. Crustacea, Plates I to V, 1894. Fishes, Plates VII to XIII. Crustacea, Plates VI to VIII. Echinoderma, Plates I to III, 1895. Echinodermia, Plates IV and V. Fishes, Plates XIV to XVI. Crustacea, Plates IX to XV, 1896. Crustacea, Plates XVI to XXVII, 1897. Fishes, Plate XVII. Crustacea, Plates XXVIII to XXXII. Mollusca, Plates I to VI, 1898. Fishes, Plates XVIII to XXIV. Crustacea, Plates XXXIII to XXXV. Mollusca, Plates VII and VIII, 1899. Fishes, Plates XXV and XXVI. Crustacea, Plates XXXVI to XLV, 1900. Fishes, Plates XXVII to XXXV. Crustacea, Plates XLVI to XLVIII. Index, Part I, 1901. Crustacea, Plates XLIX to LV. Mollusca, Plates IX to XIII, 1902. Crustacea, Plates LVI to LXVII. Crustacea, Plates LXVIII to LXXVI. Fishes, Plates XXXVI to XXXVIII, 1905. Crustacea (Malacostraca), Plates LXXVII to LXXIX. Crustacea (Entomostraca), Plates I and II. Mollusca, Plates XIV to XVIII, 1907. Fishes, Plates XXXIX to XLIII. Crustacea (Entomostraca), Plates III to V. Mollusca, Plates XIX and XX, 1908.—Re. 1 per plate. Mollusca, Plates XXI to XXIII, 1909.—As. 8 per plate.



# RECORDS

of the

# INDIAN MUSEUM

Vol. I, 1907.

*Part I.*—Contributions to the Fauna of the Arabian Sea. Hemiptera and Hymenoptera from the Himalayas. Indian Freshwater Entomostraca. The Fauna of Brackish Ponds at Port Canning, Lower Bengal, I—III. A Sporozoan from the heart of a Cow. *Miscellanea* :—The appendicular skeleton of the Dugong. An egg laid in captivity by a Goshawk. Melanic specimens of *Barbus ticto*. Two barnacles new to Indian seas. Mosquitoes of the genus *Anopheles* from Port Canning. *Anopheles* larvae in brackish water. Mosquitoes from Kumaon. Peculiar habit of an earthworm.

*Part II.*—Revision of the Oriental Stratiomyidae. An Oligochaete Worm allied to *Chaeogaster*. The Fauna of Brackish Ponds at Port Canning, Lower Bengal, IV. A Polyzoan from the Himalayas. Batrachia, Reptiles and Fish from Nepal and the Western Himalayas. The Fauna of Brackish Ponds at Port Canning, Lower Bengal, V. Oriental Diptera, I and II. *Miscellanea* :—*Gecko verticillatus* in Calcutta. The distribution of *Kachuga sylhetensis*. The distribution of *Bufo andersoni*. Note on *Rutilia nitens*. Some Indian Cerambycidae. Some Indian Hemiptera. A preoccupied specific name in *Macrothrix*. An enemy of certain Pearl Oysters in the Persian Gulf. The distribution in India of the African snail, *Achatina fulica*. Strobilasts from the surface of a Himalayan pond. Notes on *Hislopia lacustris*.

*Part III.*—Marine Polypora in the Indian Museum. The Fauna of Brackish Ponds at Port Canning, Lower Bengal, VI. Earwigs (Dermaptera) in the Indian Museum. Oriental Diptera, III. A new snake from Nepal. Marketable fish from Akyab. Freshwater Oligochaete Worms from the Punjab. Phosphorescence in Marine Animals. The rats of Dacca, Eastern Bengal. Freshwater Sponges, I—V. *Miscellanea* :—The original home of *Mus decumanus*. Colour change in *Hylobates hoolock*. Eggs of *Typhlotriton verrucosus*. The hosts of *Tachaea spongicola*. A second species of *Dichelaspis* from *Bathynomus giganteus*.

*Part IV.*—*Nudiclava monocanhi*, the type of a new genus of Hydroids parasitic on Fish. Three new Nycteriidae from India. Annotated Catalogue of Oriental Culicidae. Oriental Diptera, IV. Freshwater Sponges, VI, VII. A new Cyprinid Fish of the genus *Danio* from Upper Burma. *Miscellanea* :—A colour variety of *Typhlops braminus*. Reptiles and a Batrachian from an island in the Chilka Lake, Orissa.

Vol. II, 1908-1909.

*Part I.*—Retirement of Lieut-Col. Alcock. The Fauna of Brackish Ponds at Port Canning, Lower Bengal, VII. A new Dictyonine Sponge from the Indian Ocean. Freshwater Sponges, VIII. Remarkable cases of variation, I. A new species of Lizard of the genus *Salea*, from Assam. The Fauna of Brackish Ponds at Port Canning, Lower Bengal, VIII. A new Cavernicolous Phasgonurid from Lower Siam. New species of Marine and Freshwater Shells in the Indian Museum. Oriental Syrphidae, I. A new variety of *Spongilla loricata*. Oriental Diptera, V. *Miscellanea* :—Remarks on *Simotes splendidus*. Corrections to No. IV of "Notes on Oriental Diptera." The Isopod genus *Tachaea*. The habits of the Amphipod, *Quadrivisio bengalensis*. New varieties of *Nanina berlangeri* and *Corbicula fluminalis*. Recent additions to the Entozoa in the Indian Museum. A sub-fossil polyzoan from Calcutta. Corrections as to the identity of Indian Phylactolaemata. A peculiar form of *Euglena*.

*Part II.*—Gordiens du Musée Indien. The Fauna of Brackish Ponds at Port Canning, Lower Bengal, IX. A new species of *Danio* from Lower Burma. Rhynchota Malayana, I. *Cimex rotundatus*, Signoret. Freshwater Sponges, IX. Fruit Bats inhabiting the Andaman and Nicobar Archipelagos. A new species of Sun-Bird obtained near Darjiling. Three Indian Phylactolaemata. Two new species of Eagle-Rays (Myliobatidae). A new species of the genus *Sesarma*, Say., from the Andaman Islands. New species of Land, Marine, and Freshwater Shells from the Andaman Islands.

*Part III.*—The Fauna of Brackish Ponds at Port Canning, Lower Bengal, X, XI. Oriental Solifugae. The difference between the Takin (*Budorcas*) from the Mishmi Hills and that from Tibet. *Caridina nilotica* (Roux) and its varieties. A new species of *Charaxes* from the Bhutan Frontier. First report on the collection of

## ZOOLOGICAL RESULTS OF THE ABOR EXPEDITION, 1911-1912.

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### INTRODUCTION.

In accordance with a resolution passed at the Conference on Museums and Archaeology held at Simla in July, 1911, it was arranged by the Trustees in consultation with the Military and Education Departments of the Government of India that I should accompany the Abor Expeditionary Force as Zoologist and Anthropologist, and that Mr. R. Hodgart, Zoological Collector in the Indian Museum, should go with me as assistant.

The present volume is devoted to the zoological results and parts will be issued from time to time as reports become available for publication. The issue of the usual annual volume of the "Records" will continue as heretofore.

In addition to results obtained with the Abor Expeditionary Force, in several groups the determinations of animals obtained by Mr. F. H. Gravely in November and December, 1911, between Moulmein and the Siamese frontier will be included. The fauna of this area, at least of the Thaungyin Valley, is not very dissimilar from that of the Abor country, and notice of specimens from this area will be of interest from a comparative point of view.

Mr. Hodgart and I left Calcutta on November 13th and arrived back on April 3rd after having spent about four months in the Abor country.

On the outward journey we were detained for about a fortnight before we could proceed to Kobo, the base camp of the expedition, and this period was spent in making observations on the fauna at Dibrugarh on the left bank of the Brahmaputra and at Sadiya which lies on the right bank at the foot of the Mishmi country.

We reached Kobo on November 29th and remained until December 13th; on the 14th we left by boat-convoy up the Dihang River and arrived at Pasighat and Janakmukh on the evening of the 16th, and leaving the latter camp on the 19th we marched to Renging and Rotung, arriving on December 21st.

I was unfortunate in being unable to join the party which left Yembung, the head-quarter camp, on December 27th to explore the course of the Dihang river and survey the country to the north: shortage of transport compelled Major-General Bower to refuse my application. My main object when I joined the expedition was to explore the practically unknown Himalayan fauna

of the N.-E. Frontier, but it now became evident that this idea would have to be abandoned. As events turned out this was not so disadvantageous as was feared, for the fauna of the foot-hills yielded material of very considerable interest and in investigating this region it was not necessary to make any drastic reduction in the apparatus required to carry on the work. But the country visited must be regarded purely as the foot-hill region of the north-east Himalayas and this fact must not be lost sight of in any comparisons which may be drawn between the Abor fauna and that of the ranges further to the west.

We remained at Rotung until January 12th, when we proceeded to the head-quarter camp at Yembung, and a week later I received permission to join a small party with an Indian surveyor under Capt. A. L. M. Molesworth which was going up the right bank of the Dihang to explore the courses of the Siyom and Shimang rivers, two large tributaries of the Dihang. I left with Capt. Molesworth on January 23rd. We reached Parong, a village two marches below Riga, and Damda which is some ten miles up the Siyom river, and returned to Yembung, sooner than was anticipated, on February 3rd. Triangulation did not form part of the survey work on this occasion; there were consequently no halts of any considerable length and the greater part of the time was occupied in hard marching which afforded but little facility for zoological work. Subsequently I proceeded to the Komsing camp, close to the Abor village of that name, and remained there until March 3rd, but the work accomplished during this period was almost entirely anthropological.

On my return to Yembung I proceeded as soon as possible to Rotung, where I purposed staying a few days to make further observations on the zoology of the district. But Capt. Sir George Duff Dunbar, who was then in command of Rotung post, suggested that I should make a short expedition to the west beyond Kalek and the Sireng valley towards Misshing, offering to provide an escort and Abor cooly transport for the purpose. I accepted this offer gladly, and in company with Mr. J. Coggin Brown of the Geological Survey and Dr. Falkiner of the Assam Valley Light Horse, who was then attached to the Lakhimpore Military Police, I left Rotung on March 15th, marching two days towards the west, halting the third day and returning on the evening of the 19th. This expedition gave me an opportunity of visiting fresh country with high tree-jungle of a type not elsewhere seen, a change which was of course accompanied by a corresponding change in the fauna. My thanks are due to Sir George Dunbar for suggesting this expedition and for making every arrangement necessary for its success.

On the morning of March 20th we left Rotung and marched beyond Renging to the camp of the 32nd Pioneers in the Sirpo valley and after a day's halt proceeded to Pasighat, from which place we reached Balek, where three days were spent in anthropological work. Returning to Pasighat we proceeded on March

27th by boat-convoy to Kobo, and leaving there a few days later arrived in Calcutta on the evening of April 3rd.

The Abor country lies in the N. E. corner of the Indian Empire and is bounded on the east by Mishmi country, on the north by Tibet, on the west by the land inhabited by the Miris and on the south by the Brahmaputra River. Plate I., which is reproduced by permission from the maps made during the expedition by officers of the Survey of India under Capt. O. H. B. Trenchard, R.E., shows the routes which I traversed and the principal places at which collections were made.

In a north and south direction the Abor country extends for about 80 miles.<sup>1</sup> Between the base camp at Kobo and Janakmukh and Balek it consists of an alluvial plain situated at a height of 400 to 600 feet above sea-level and clad with dense jungle interspersed with open patches of long grass or *chapris*. In some places the jungle has at one time or another been cleared for cultivation, but the older clearings are for the most part so thickly grown with scrub and creepers as to be almost impenetrable. To the north of this the country is a maze of hills, often precipitous, and intersected by the boulder-strewn courses of the numberless small streams that drain into the Dihang river. All the hills were originally clothed from foot to summit with tree-jungle, but frequently, more particularly in the vicinity of the Abor villages, large tracts of country have been cleared. Many such areas have, after a period of years, been discarded for cultivation purposes and soon develop thick scrub-jungle.

The majority of the specimens obtained were found at comparatively low altitudes between 400 and 2,500 ft., but some were taken at greater heights up to about 5,000 ft. and part of a small collection of insects, made for me by Mr. J. Coggin Brown of the Geological Survey, was obtained on Geku hill at a height of about 10,000 ft. Bapu, the highest of the foot-hills proper, reaches an altitude of 6,390 ft.

As regards invertebrates, the best results were obtained by searching under bark and in rotten wood and large collections were made by this means alone. In particular some dead and partially decayed jack-fruit trees, which were being cut by the 32nd Sikh Pioneers in the vicinity of Rotung, afforded admirable material; many of the branches were hollow and bored and when split open were found to be literally filled with a varied assortment of Carabidae, Staphylinidae, Passalidae, Endomychidae, Heteromera, Rhynchophora, Dermaptera and Blattoidea along with representatives of many other groups. Considerable collections were also made under stones and numerous interesting species were found in this situation.

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<sup>1</sup> Only the southern portion of the Abor country is shown on the map (Pl. I.); the great ranges further to the north were not visited.

In the Abor country the cold weather season is also the driest season of the year and numbers of invertebrates, to which an abundance of moisture is a necessity, take refuge during this period in plantain trees, living behind the great ensheathing leaf-stems. Water is invariably found in the leaf-base and the atmosphere in the almost completely closed chamber behind the leaf-stems is probably always at or near saturation point. A considerable amount of rain fell during February and March, and in the latter month it was noticed that the numbers of animals found in such situations had greatly diminished.

Small Dytiscidae, Odonata larvae and Oligochaete worms were found in the tops of plantains and screw-pines (*Pandanus*), living in a collection of water at the leaf-base at from 20 to 40 ft. above the surface of the ground.

No lakes or pools of standing water were met with in the country and practically all the aquatic animals obtained were taken in small streams and rivers draining into the Dihang or its larger tributaries: in the Dihang itself, which in the rains appears to rise in some places at least sixty feet above its winter level, practically nothing could be found. The smaller rivers and streams of the hills teem with the larvae of Neuroptera and Odonata and in the warm weather the perfect insects must occur in very great numbers. Brachyurous Crustacea were not uncommon, but Macrura appeared to be represented only by a single species of *Palaemon*. Fish were plentiful and some, along with tadpoles belonging to the families Ranidae and Pelobatidae, show interesting adaptations to life in hill-streams subject to sudden spate.

The different groups of animals are unfortunately very unevenly represented in the collection, but this was to a large extent unavoidable. The cold weather season is not the best time of year for zoological work and the poverty of the collection in several respects, notably in some sections of the Insecta, must be attributed to this fact. Other groups, again, should have received far more attention than I was able to give them, for only by the devotion of a specialist's whole time to the subject could satisfactory results have been obtained among the birds and mammals.

My activities and opportunities for work were, as was only to be expected, somewhat limited by the restrictions necessary in the case of a military expedition carried out in a hostile country, but it was only in a few instances that these restrictions were severely felt. Work with an escort must of necessity have some drawbacks, though in many cases, more especially with Gurkhas, the escort was keenly interested and showed itself adept in the capture of the more elusive species.

To express my gratitude for all the help I received in the course of the expedition is a difficult task. I have in the first place to thank Major-General Bower, C.B., General Officer commanding the Force, for the interest which he took in my work and for the facilities extended to me.

To the 32nd Sikh Pioneers I am under very great obligation for the large collections of Reptilia and other animals which they made on my behalf. During the winter season most of the reptiles were in hiding beneath the ground or in roots of trees, and in these situations they were found by the Pioneers when cutting roads along the hill-sides. The extent of the help they gave me may be judged from the fact that while snakes are now represented by twenty-six species, three hitherto unknown and one belonging to an undescribed genus, my own individual efforts only resulted in the acquisition of three common forms. Through the instrumentality of the British officers of the regiment and in particular of Capt. the Hon. M. de Courcy each non-commissioned officer on works was provided with a large section of bamboo fitted with a plug and every day a valuable collection of snakes, lizards, frogs, centipedes, scorpions, etc., was obtained.

Numerous specimens were also contributed by Col. (now Brigadier-General) D. C. F. Macintyre, Capt. A. L. M. Molesworth, by Capt. J. S. O'Neill, Capt. F. H. Stewart and Capt. R. S. Kennedy of the Indian Medical Service, by Capt. H. W. Price and Mr. G. F. T. Oakes. We are indebted to Major Sweet, Capt. B. R. Nicholl, Capt. J. Masters and Mr. I. Burn Murdoch for the loan of various mammals and to Dr. J. Falkiner for the loan of a collection of birds.

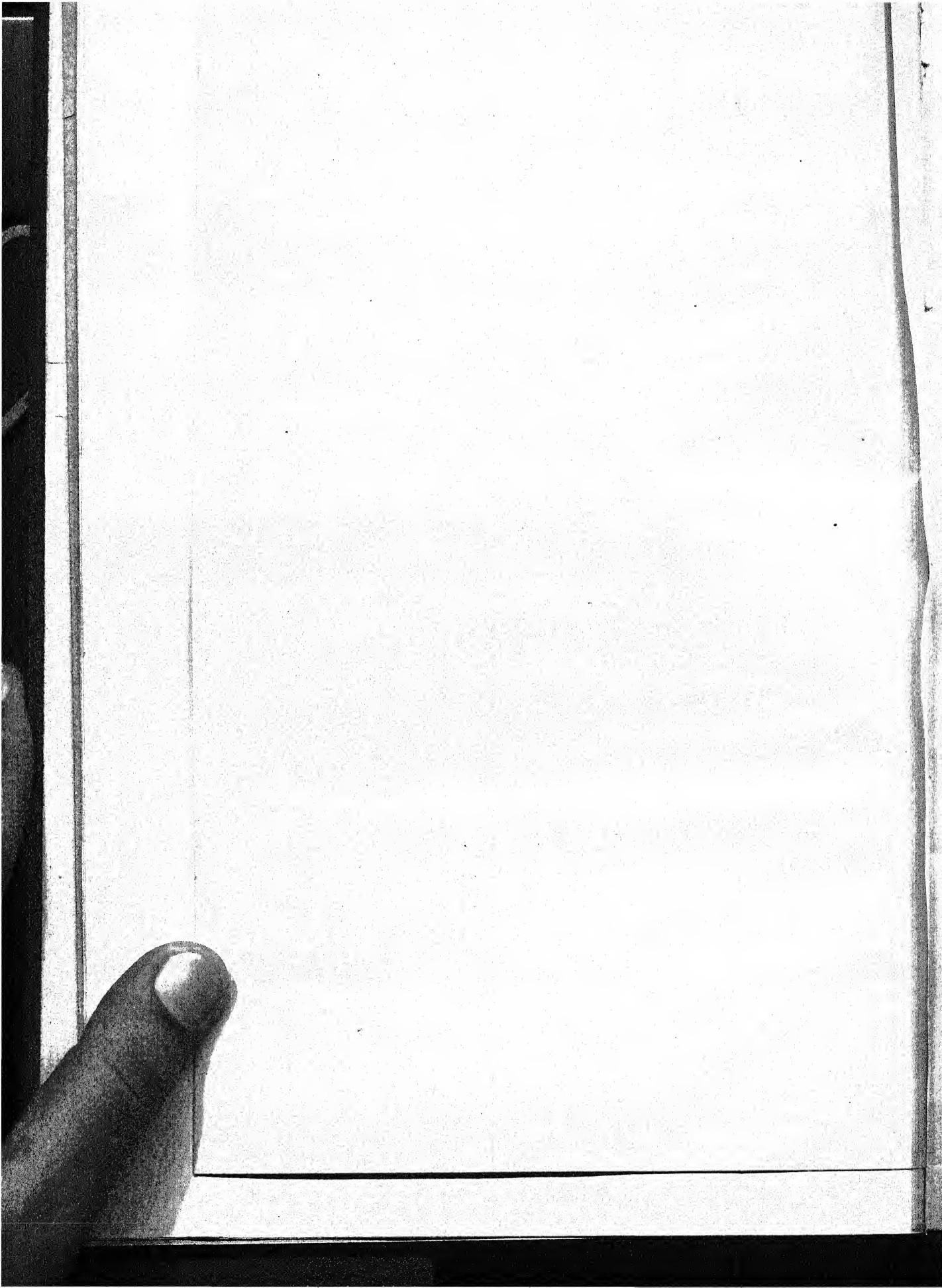
Opportunity will I hope be found of making fuller individual acknowledgments in the course of publication of the different reports, though it will still be impossible for me to express my thanks in an adequate manner for all the kindness and hospitality I received from officers of different services attached to the expedition.

I was fortunate in having Mr. R. Hodgart with me as my assistant. Throughout the period during which we were attached to the expedition his energy was unremitting and he spared no efforts to render the work a success.

STANLEY KEMP,

*June 1st, 1912.* Offg. Superintendent, Indian Museum.





## I. BATRACHIA.

(Plates ii—iv.)

By N. ANNANDALE, D.Sc., F.A.S.B., Superintendent, Indian Museum.

Mr. Kemp's collection of Batrachia from the Abor country and the frontiers of Assam comprises 57 specimens of frogs and toads and a considerable number of tadpoles. With those obtained on the Expedition of 1911—1912 I have included two interesting specimens taken by Mr. Kemp on a previous visit to the frontier of eastern Bhutan. In all at least 25 species are represented, of which about one-third are new to science, while several have only been recorded hitherto from Burma or from Assam south of the Brahmaputra. The collection, therefore, affords the opportunity of making important additions to the fauna of the Himalayas, the animals of the extreme eastern region of which have up to the present been almost unknown.

### PART I.—SYSTEMATIC.

List of species represented in Mr. Kemp's collection:—

- |                                      |  |
|--------------------------------------|--|
| 1. <i>Rana cyanophlyctis</i> .       | 14. <i>Rhacophorus maculatus himalayensis</i> , nov. |
| 2. <i>R. liebigii</i> .              | 15. <i>Rh. tuberculatus</i> .                        |
| 3. <i>R. tigrina</i> .               | 16. <i>Ixalus asper</i> .                            |
| 4. <i>R. limnocharis</i> .           | 17. <i>I. annandalei</i> .                           |
| 5. <i>R. alticola</i> .              | 18. <i>I. argus</i> , nov.                           |
| 6. <i>R. granulosa</i> .             | 19. <i>I. tuberculatus</i> .                         |
| 7. <i>R. afghana</i> .               | 20. <i>Chirixalus doriae</i> .                       |
| 8. <i>R. gerbillus</i> , nov.        | 21. <i>Phrynoderma moloch</i> , nov.                 |
| 9. <i>Micrixalus borealis</i> , nov. | 22. <i>Bufo melanostictus</i> .                      |
| 10. <i>Rhacophorus maximus</i> .     | 23. <i>B. himalayanus</i> .                          |
| 11. <i>Rh. bimaculatus</i> .         | 24. <i>Megalophrys (?) major</i> .                   |
| 12. <i>Rh. naso</i> , nov.           | 25. <i>M. kempii</i> , nov.                          |
| 13. <i>Rh. microdiscus</i> , nov.    |  |

#### (a) ADULTS.

##### Fam. RANIDAE.

1. *Rana cyanophlyctis*, Schneid.

Boulenger, Fauna, p. 442.

This frog occurs all over the plains of India and ascends the Himalayas to altitudes of at least 5,000 ft. In Kumaon in the

Western Himalayas it is the common frog at 4,500 ft., but at 6,000 ft. is entirely replaced by *R. blanfordii*. It is very largely aquatic in habits and is not as a rule found in dense jungle.

Mr. Kemp obtained a single specimen at Dibrugarh.

## 2. *Rana liebigii*, Günth.

Boulenger, *Fauna*, p. 445.

*R. liebigii* is very common in the Darjiling Himalayas at altitudes between 4,000 and 10,000 feet; it also occurs, though rarely, in the Western Himalayas (Simla and Kashmir), while to the south-east its range extends to northern Tenasserim. It is essentially a jungle frog and is usually found among dense undergrowth or at the edge of streams.

No adults of this species were obtained on the expedition, but two tadpoles were taken in a small stream near Yembung (alt. 1,100 ft.) on the east side of the Dihang River.

## 3. *Rana tigrina*, Daud.

Boulenger, *Fauna*, p. 449.

Although it is apparently rare in the Himalayas, *R. tigrina* occurs all over the plains of India. In different parts of India, however, its habits differ considerably and certain structural differences also seem to occur, so that it is probable that several different races will ultimately have to be recognized as distinct. In Bengal *R. tigrina* is essentially a "tank" frog, inhabiting moderately large masses of water.

Two specimens were obtained by Mr. Kemp at Sadiya under a log at the edge of the Dikrang River.

## 4. *Rana limnocharis*, Wiegm.

Boulenger, *Fauna*, p. 450.

Being much more adaptable in its habits than *R. tigrina*, *R. limnocharis* has an even wider range than that species. It is equally at home in flooded rice-fields and at the edge of rocky streamlets in the densest jungle. Both in the Himalayas and in the mountains of Burma it ascends to an altitude of at least 6,000 ft.

Mr. Kemp obtained specimens at Sadiya, Kobo and Rotung and in the Siyom valley below Damda.

## 5. *Rana alticola*, Boulgr.

Boulenger, *Cat. Batr. Sal. Brit. Mus.* (2nd ed.), p. 63, fig. (1882).

The range of this frog is considerable both in longitude and latitude and also in altitude. Colonel Alcock obtained specimens of

the characteristic tadpole at an altitude of 8,500 ft. in the Hundur Yarm Valley in northern Kashmir, while Capt. R. B. Seymour Sewell has recently taken precisely similar larvae a few feet above sea-level and a few yards from the shore, in a small stream running into Heinze Basin on the coast of Tavoy. I have also examined larvae from other parts of Tenasserim and Assam and from Little Andaman I., and adults from Tenasserim and Assam, Bengal and Orissa. I have not, however, seen specimens from any place in the plains west of Calcutta. In Lower Burma and Orissa the frog is usually found amongst dense vegetation at the edge of ponds and lakes. On the shores of the Sar Lake near Puri it is abundant on the leaves of plants that grow out of the water and also on ledges in the sides of old wells.

The back of the young frog is brown, often mottled with black, but in the adult it becomes of a bright leaf-green. I have redescribed the tadpole below (p. 22). *R. alticola* is of much more slender habit and usually of smaller size than *R. erythraea*, which resembles it in habits, but apparently is not found west of the Bay of Bengal.

Mr. Kemp took a small specimen of *R. alticola* on the Assam-Bhutan frontier in the north-east of the Mangaldai division of the Darrang district in January, 1911.

#### 6. *Rana granulosa* (Anderson).

*Hylorana granulosa*, Anderson, *J.A.S.B.*, (2), xl, p. 23 (1871).

? *Rana tytleri*, Boulenger, *Fauna*, p. 458 (*partim*).

*Rana granulosa*, *id.*, *Ann. Mus. Genova* (2nd ser.), xiii, p. 333, pl. viii, fig. 2 (1893).

This frog is known from the Karin Hills and Pegu in Burnia, from Yunnan and from north-eastern Assam (Sibsagar). It is apparently arboreal in habits.

A specimen was taken on a tree-trunk near Dibrugarh.

#### 7. *Rana afghana* (Günth.).

*Polypedates afghana*, Günther, *Rept. Brit. Ind.*, p. 432.

*Rana latopalmata*, Boulenger, *Fauna*, p. 462.

*Rana afghana*, *id.*, *Ann. Mus. Genova* (2nd ser.), v, p. 420 (1888).

It is very unfortunate that this frog should have to bear the inappropriate specific name "afghana," for there can be little doubt that its range does not extend west of Nepal. It is not uncommon in the Darjiling Himalayas at moderate altitudes and has also been found in Assam and Burma.

An adult was taken by Mr. Kemp at Yembung (alt. 1,100 ft.), and also two tadpoles, which are noticed below (p. 24).

8. *Rana gerbillus*, sp. nov.

(Plate ii, fig. 1.)

Allied to *R. jerboa* (Günther), from which it differs in its much smaller tympanum and in other particulars.

*Habit* slender. Length from snout to vent 33 mm.

*Head* broad, triangular; snout bluntly pointed, somewhat depressed at the tip, a trifle longer than the diameter of the orbit; nostril a little nearer the tip of the snout than the eye, which is large and prominent; interorbital space flat, as wide as the upper eyelid; canthus rostralis bluntly angular; loreal region concave; tympanum not very distinct, small, about  $\frac{1}{3}$  as wide as eye.

*Mouth*.—A distinct tooth at the tip of the lower jaw; no free papilla on the tongue; vomerine teeth ill-developed, in two small roundish patches situated close together in the middle of the palate between the choanae.

*Limbs* slender. Fingers slender, with well-developed disks; that on the third rather larger than the tympanum; that on the first small; a rudiment of a web between the third and fourth fingers; others quite free; first finger shorter than second. Hind limbs very long, the tarso-tibial articulation reaching far beyond the edge of the snout. Toes almost completely webbed; their disks subequal, smaller than the tympanum; subarticular tubercles large but not prominent, oval; a low oval inner metatarsal tubercle; no outer one; no tarsal fold.

*Skin*.—A distinct glandular latero-dorsal fold and another, less distinct, extending from the eye above the tympanum almost to the shoulder. Dorsal surface of the head minutely pitted, of the back obscurely granular with large compressed longitudinal tubercles scattered more especially on the sides. Ventral surface and limbs smooth.

*Colouration*.—Dorsal surface very dark grey obscurely mottled with a paler shade; lips with pale vertical stripes; sides pale, spotted with dark grey; limbs, especially the thighs, conspicuously barred; ventral surface dull greenish yellow with large round or oval brown spots on the chin, throat and chest.

*Habitat*.—Yembung, Abor foot-hills at an altitude of 1,100 ft. A single specimen was found at the edge of a small stream in February.

*Type*.—No. 16925 of Indian Museum register of Reptiles and Batrachia.

*Rana jerboa* (Günther), to which this new species is most closely allied, is found in Burma, the Malay Peninsula, Java, Borneo, etc.

9. *Micrixalus borealis*, sp. nov.

(Plate ii, fig. 2.)

Closely allied to *Rana tenasserimensis*,<sup>1</sup> Sclater, from which it may be distinguished by the small size of the disks on its

<sup>1</sup> P. Z. S., 1892, p. 345, pl. xxiv, fig. 4, and List Batrachia Ind. Mus., p. 8 (1892).

fingers, its hidden tympanum and its almost completely webbed toes.

*Habit* stout. Length from snout to vent 25 mm.

*Head* short, broad, triangular, by no means depressed; snout bluntly pointed, convex at the tip, a little shorter than the orbit; canthus rostralis rounded; loreal region not concave, sloping outwards and downwards; eye large, not very prominent; interorbital region slightly convex, a little broader than the upper eyelid; tympanum concealed; a prominent fold running backwards and downwards from the eye to a point a little behind the gape.

*Mouth*.—A prominent tooth at the apex of the lower jaw; no trace of vomerine teeth; the choanae situated far forward; no papilla on the tongue. An internal vocal pouch in the male.

*Skin*.—No dorso-lateral fold. Dorsal surface minutely warty; ventral surface almost smooth but with a rather indistinct reticulation of grooves; a transverse fold running across the posterior end of the throat in the male.

*Limbs* stout. Fore limbs short; fingers short; the first a little shorter than the second; disks very small but distinct; a rudiment of a web between all the fingers; subarticular tubercles inconspicuous but of fairly large size. Tibio-tarsal articulation reaching the eye; toes moderately slender, with very small disks; web almost complete but not quite reaching or barely reaching the disks of the first and fifth toes; subarticular tubercles inconspicuous; an elongate but not very prominent internal metatarsal tubercle followed by a fold of skin on the tarsus; another fold on the external margin of the foot; no outer metatarsal tubercle.

*Colouration*.—Back dark brown mottled with purplish black; a dark interorbital cross-bar usually present; limbs obscurely barred and digits more conspicuously so; ventral surface yellowish, powdered on the throat and chin with purple-brown, as a rule so densely that the skin appears almost black to the naked eye; ventral surface of hands, feet and thighs powdered in a similar manner but not so densely; belly sometimes spotted.

*Localities*.—Rotung (alt. 1,300 ft.) and about 3 miles S. of Yembung.

*Type*.—No. 16932 in Indian Museum register of Reptiles and Batrachia.

I think I am right in referring this species, of which I have examined eleven specimens, to Boulenger's genus *Micrixalus* rather than to *Rana*; for I can find no trace of vomerine teeth, while the small size of the frog and its general facies are features in which it resembles the south Indian species included in the former genus. Sclater's *Rana tenasserimensis*, of which three type-specimens are now in our collection, has apparently vomerine teeth in some individuals and none in others, but these teeth are never well developed. It should also, in my opinion, rank as *Micrixalus*.<sup>1</sup>

<sup>1</sup> See Boulenger, P.Z.S., 1883, p. 205, and *Fauna*, p. 464; also W. L. Sclater, P.Z.S., 1892, p. 345, pl. xxiv, fig. 4, 4a, and Boulenger, Ann. Mus. Genova (2nd ser.), xiii, p. 331.

Ten specimens of *M. borealis* were taken under stones in a stream at Rotung and one a few miles S. of Yembung.

10. *Rhacophorus maximus*, Günth.

Boulenger, *Fauna*, p. 472.

A common species on the lower slopes of the Darjiling Himalayas and the Khasi Hills. Colonel Godwin-Austen obtained specimens in the Dafla country.

Mr. Kemp obtained a half-grown specimen at Upper Rotung at an altitude of about 2,000 ft.

11. *Rhacophorus bimaculatus*, Boulgr.

Boulenger, *Fauna*, p. 472.

Not uncommon in the Khasi Hills. Mr. Kemp's only specimen, which was taken at Rotung (alt. 1,300 ft.) in January, has the web of the feet of a bright scarlet colour and lacks the dark spots on the sides usually so characteristic of the species. In the former particular it agrees with other specimens in our collection.

12. *Rhacophorus naso*, sp. nov.

(Plate ii, fig. 3.)

This peculiar species can be distinguished from any other of the genus that occurs in Assam or Burma by the dermal appendage on its snout.

*Habit* moderately stout. Length from snout to vent 43 mm.

*Head* rather broad, triangular, with convex sides; snout much longer than orbit, pointed, convex above, nostril much nearer tip of snout than eye; canthus rostralis indistinct; loreal region concave, almost horizontal. Diameter of tympanum, which is distinct, about  $\frac{2}{3}$  that of eye.

*Mouth*.—No prominent tooth at apex of lower jaw; no papilla on the tongue; vomerine teeth forming two small, almost circular patches, one close to the inner margin of each choana; choanae small.

*Skin* of dorsal surface rugose with many prominent and irregular tubercles; a small subquadangular dermal projection on the snout; rounded tubercles scattered on the basal part of the thighs; ventral surface coarsely granular, more so on the chest and throat than on the belly. A fairly distinct dorso-lateral fold and a more prominent one running from the eye above the tympanum to the shoulder; serrated cutaneous fringes on the outer edges of the forearm and the shin.

*Limbs* stout, not very long. Fingers with a rudimentary web; their disks well developed, transversely oval; that on the third finger almost as large as the tympanum; subarticular tubercles well developed. The tibio-tarsal articulation reaches the eye; toes almost completely webbed; their disks like those of the fingers;

subarticular tubercles well developed; a somewhat elongate but not very prominent inner metatarsal tubercle; no corresponding outer tubercle.

*Colouration*.—Dorsal surface purplish-brown irregularly marked with dark slate-colour; irregular paler markings on the sides; limbs irregularly marked; fingers and toes barred with alternate brown and grey stripes. Ventral surface dirty white, shaded posteriorly with dark grey; dark grey spots on throat and an irregular reticulation of the same shade on the chest. Ventral surface of hands and feet grey, with the tubercles white; a white spot on the soles in the place where an external metatarsal tubercle would be.

*Habitat*.—Egar stream between Renging and Rotung (9-i-12).

*Type* (a unique specimen). No. 16929 in the Indian Museum register of Reptiles and Batrachia.

### 13. *Rhacophorus microdiscus*, sp. nov.

(Plate ii, fig. 4.)

This species is easily recognized by the small size of its digital disks.

*Habit* slender. Length from snout to vent 29 mm.

*Head* large, flat, broadly ovoid; snout rounded in front, by no means prominent, rather shorter than the orbit; nostril much nearer tip of snout than eye; canthus rostralis indistinct; loreal region concave, oblique; tympanum distinct, close to eye; its diameter about  $\frac{1}{3}$  of that of eye; interorbital space about as wide as upper eye-lid, flat.

*Mouth*.—No tooth at apex of lower jaw; no papilla on the tongue; choanae large; vomerine teeth in two short, ridge-like series running obliquely backwards and inwards from a point near the anterior inner margin of the choanae but widely separated from one another.

*Limbs* slender but short. Fingers with a slight rudiment of a web; their disks very small, that on the third being much less than  $\frac{1}{2}$  as wide as the tympanum; subarticular tubercles well developed; a large rounded inner metacarpal tubercle. Tibiotarsal articulation barely reaching the eye; disks of toes like those of fingers; feet less than half webbed; subarticular tubercles well developed; an elongate but by no means prominent inner metatarsal tubercle.

*Skin* of dorsal surface, throat and chest smooth; that of belly separated into polygonal areas by a very distinct network of grooves; on the posterior part these areas gradually take the form of low conical tubercles; isolated rounded tubercles on basal part of thighs. No dorso-lateral fold; an indistinct fold running from above tympanum to shoulder.

*Colouration*.—Dorsal surface pale slate-grey irregularly marked with darker grey and powdered with black; dorsal surface of limbs indistinctly barred; outer margin of thigh reddish; ventral surface dirty white.

*Habitat*.—Kobo, at base of Abor foot-hills (alt. 400 ft.):  
29-30-iii-12.

*Type* (a unique specimen). No. 16924 in Indian Museum register of Reptiles and Batrachia.

14. *Rhacophorus maculatus* (Günther).

*Rhacophorus maculatus* and *R. leucomystax*, Boulenger, *Fauna*, pp. 474, 475.

I have little doubt that what may be called the "Common Tree-frog" of Peninsular India, the Himalayas and the Malay Peninsula really represents three local races of a single species. These three races or subspecies may be distinguished as follows:—

1. *Rhacophorus maculatus* (Günther) (*forma typica*). No parieto-squamosal arch; dorsal surface of skull smooth; skin of dorsal surface of head free. *Distribution*.—Peninsular India and Ceylon.

2. *Rhacophorus maculatus himalayensis*, subsp. nov. A well-developed parieto-squamosal arch; dorsal surface of skull smooth; skin of dorsal surface of head free. *Distribution*.—The Eastern Himalayas, Assam, western China.

3. *Rhacophorus maculatus leucomystax* (Gravenhagen). A well-developed parieto-squamosal arch; dorsal surface of skull rugose; skin of dorsal surface of head adhering to the skull. *Distribution*.—Lower Burma, the Malay Peninsula and many of the Malay islands.

Mr. Kemp's specimens belong to the second race. The larvae of the three races are discussed below (p. 24).

Two small specimens were taken at Kobo and a very large one on the east side of the Dihang R. at an altitude of 1,100 feet.

15. *Rhacophorus tuberculatus*, Anderson.

(Plate ii, fig. 5.)

Anderson, *J.A.S.B.*, (2), xl, p. 26; Boulenger, *Fauna*, p. 474.

The specimens in Mr. Kemp's collection agree well as regards structure and dimensions with the late Dr. Anderson's description and with his type specimens, which are in the same condition as they were when the species was described. The colours of the latter specimens had, however, already faded at that date and the fresh ones now before me are particularly interesting in this respect. No two of the four brought back from the Abor country and taken together in circumstances which I will describe immediately, are precisely identical in colouration; but in all the colours are so blended that those commonly found on the stems of bamboos

growing in thickets in damp jungle are accurately reproduced. The back and the dorsal surface of the head and limbs are in all dull clay-colour sparingly powdered with black and suffused more or less definitely with yellow, the canthus rostralis is outlined in black, the ventral surface is pale yellow and the inner surface of the thighs wholly or partly scarlet. In one individual there is a narrow black, white-edged line running backwards along each side from the eye to the base of the hind limb, while the back of the head and the back are ornamented with two large irregular marks outlined by similar lines. In this specimen, which appears to be an adult male, there are also dark longitudinal lines on the limbs and on the inner margin of the fifth toe and the web that intervenes between that toe and the fourth. In the second individual, a female, the sides of the back are so strongly suffused with yellow that they may be described as ochraceous, the webs of the feet are almost black and the red colour of the inner surface of the thigh extends down that of the shin. In another male, rather smaller than the first, there are small black spots on the back and a dark-edge white line running transversely on the dorsal surface above the vent. The fourth specimen, probably a young male, has no very definite markings. The colouration of the dorsal surface in all the specimens bears a close resemblance to that of a bamboo-stem overgrown with minute fungi and lichens such as are usually found on bamboo-stems in a very damp atmosphere. The scarlet of the thighs would be completely concealed in the attitude of rest.

It is interesting to have the opportunity of comparing Anderson's types with fresh specimens of the species, but it is still more interesting to be able to put on record the peculiar circumstances in which these specimens were taken. They were found in an internode of bamboo which was intact as regards both its sides and its two nodes, except that there was in one side a small hole apparently made by some insect, less than a quarter of an inch in diameter. When the bamboo was split open in preparation for bridge-making the four frogs were seen seated on the inner surface near one end (the upper at the time), while two earthworms and a land-planarian occupied the other. There can be little doubt, therefore, that they had entered the bamboo as small frogs and had been supplied with food by the intrusion of worms and other small animals through the hole by which they had originally entered, and from which their increase in bulk rendered it impossible for them to emerge. In spite of the fact that they must have lived for some considerable time practically in the dark they had preserved their colouration, which was of a distinctly protective type.

Four specimens from Upper Rotung (alt. *ca.* 2,000 ft.): 22nd January 1912, collected by Capt. the Hon. M. de Courcy. Anderson's specimens were from Sibsagar in N.-E. Assam. This place is situated on the northern bank of one of the smaller tributaries of the Brahmaputra.

16. *Ixalus asper*, Boulgr.

Boulenger, *P.Z.S.*, 1886, p. 415, pl. xxxix, and *Ann. Mus. Genova* (2nd ser.), xiii, p. 310, 1893; Sclater, *P.Z.S.*, 1892, p. 347; Robinson, *Journ. F.M.S. Mus.*, i, p. 24.

This species appears to be the most widely distributed of the Indian *Ixali*. It was originally described from the mountains of Perak in the Malay Peninsula and was found by the late Signor Fea in the Karin Hills and by one of our collectors in the hills between Burma and Siam. The Indian Museum possesses a specimen labelled as being from Kolasi in the Purnea district of Bihar, but this specimen very possibly came actually from the foot-hills of eastern Nepal.

The irregular white or greyish-white markings on the posterior part of the body of *I. asper* give it exactly the appearance of being overgrown with a mould or fungus. Whether this is of any protective advantage to the frog may perhaps be doubted, but I have noticed a similar phenomenon in the case of several Malayan insects belonging to the orders Coleoptera and Rhynchota and it is well known that in tropical jungles insects are frequently attacked by fungi which produce a white mycelium and finally, having killed them, fasten their dead bodies by means of this mycelium to tree-trunks or other inanimate objects.

A specimen of *Ixalus asper* was taken on a tree-trunk at the edge of Egar stream between Renging and Rotung on 9th January, 1912. With it were taken the type specimen of *Rhacophorus naso*, a specimen of *Ixalus tuberculatus* and also tadpoles of two species, a *Megalophrys* (*M. ? major*) and a Ranid which cannot be identified.

17. *Ixalus annandalei*, Boulgr.

(Plate iii, fig. 2.)

Boulenger, *J.A.S.B.*, 1906 (2), p. 385.

This species was not taken on the Abor Expedition, but a single specimen was obtained by Mr. Kemp in December, 1910, on the Bhutan frontier of Assam in the Mangaldai division of the Darrang district. It is common in the Darjiling district between 4,000 and 5,000 ft. and occurs both among dead leaves and low herbage in the jungle and on tea-bushes.

18. *Ixalus argus*, sp. nov.

(Plate iii, fig. 3.)

*Habit* moderately-slender, *Khacophorus*-like. Length from snout to vent 27 mm.

*Head* short and broad, triangular; snout blunt, somewhat depressed at tip, obliquely truncate vertically, projecting, a little longer than the orbit; nostril nearer tip of snout than eye; canthus rostralis fairly distinct; loreal region vertical, concave; tympanum distinct, small, about  $\frac{1}{3}$  as broad as eye, interorbital space broader than upper eyelid.

*Mouth*.—A small tooth at apex of lower jaw; no papilla on the tongue; choanae small, widely separated, situated far forwards.

*Skin*.—No latero-dorsal or supratympanic folds. Skin of head and neck smooth, of back beset with small scattered tubercles; ventral surface smooth.

*Limbs* slender. Fingers slender, free, with large disks; that on third finger as large as tympanum; first finger a little shorter than second; subarticular tubercles large, rounded, a little prominent; no metacarpal tubercles. Tibio-tarsal articulation reaching nostril; toes fully webbed; disks a little smaller than those on fingers; subarticular tubercles distinct but by no means prominent; a very distinct inner, but no outer, metatarsal tubercle; no tarsal fold.

*Colouration*.—Dorsal surface dark slate-grey with a paler reticulation on the back that gives it the appearance of being faintly ocellated; limbs and fingers conspicuously barred with dark grey and white; ventral surface dirty white faintly spotted on the throat and chest with grey; soles of feet and palms of hands dark grey.

*Habitat*.—Upper Renging, alt 2,150 feet.

*Type* (a unique specimen). No. 16950 in the Indian Museum register of Reptiles and Batrachia.

#### 19. *Ixalus tuberculatus*, Anderson.

(Plate iii, fig. I.)

Anderson, *Anat. Zool. Res. Yunnan Exp.*, p. 855, pl. lxxviii, fig. 7 (1878).

I think I am right in identifying a series of specimens in Mr. Kemp's collection with this species, but Anderson's figure is poor and his specimens are not forthcoming for comparison. It is evidently variable in several characters, notably in stoutness of habit, in colouration, in roughness of skin and in the relative size of the disks of the fingers and toes. In some of the Abor specimens the skin of the dorsal surface is smooth except for small scattered tubercles, in others the tubercles are so much larger and closer together that it is quite rough; in some the finger-disks are much smaller than the toe-disks, but in others they are of almost exactly the same size, while some individuals are much stouter than others. In all the ground-colour of the dorsal surface is very dark slate-grey rather than olive, but this may be due to the fact that the specimens had been hardened in formalin before being preserved in spirit. A pale cross-bar between the eyes can usually be detected and there is always a pale patch on the sides near the groin marked diversely with black; the corresponding surface of the outer margin of the thighs is similarly marked; in some individuals there is a large dark x-shaped mark on the back.

Specimens were taken at Janakmukh (600 ft.), in Eggar stream between Renging and Rotung, at Rotung (1,300 ft.) and at Kalek (3,800 ft.). At the two last-named localities several individuals were found between the 24th and 29th of December hiding under

the leaf-stems of banana-trees. Probably they were hibernating. In all seven specimens were found.

20. *Chirixalus doriae*, Boulgr.

Boulenger, *Ann. Mus. Genova* (2nd ser.), xiii, p. 341, pl. x, fig. 5 (1893).

A single male taken under a log at Kobo (alt. 400 ft.) agrees well with Mr. Boulenger's figure and description. *Ch. doriae*, which is the only known species of the genus, was originally found by the late Signor Fea in the Karin Hills.

21. *Phrynodermma moloch*, sp. nov.

(Plate iii, fig. 4.)

This species differs from *Phrynodermma asperum*, Boulenger,<sup>1</sup> the only one hitherto known, in several important characters, notably in the much more pronounced nature of the asperities on its back.

*Habit* slender. Length from snout to vent 41 mm.

*Head* short, broad, triangular, depressed; snout about as long as orbit, sinuously truncate transversely, obliquely truncate vertically; nostril close to tip of snout, very prominent; eye large, prominent; canthus rostralis indistinct; loreal region almost vertical, slightly concave; inter-orbital region slightly concave, broader than upper eye-lid; tympanum fairly distinct, about  $\frac{2}{3}$  as wide as eye.

*Skin*.—No supratympanic or dorso-lateral folds; back bearing very prominent ridge-like, more or less serrated, warts which run longitudinally and obliquely; these warts larger on neck and across shoulders, on which they form A-shaped figures; shorter warts on head and dorsal surface of limbs; throat and ventral surface of limbs smooth; belly and sides coarsely granular.

*Limbs* slender but rather short. Fingers free, slender, flattened; disks very large, that on the 3rd finger nearly equalling the tympanum; subarticular tubercles small; external and internal subcarpal tubercles indistinct. Tibio-tarsal articulation reaching tympanum; toes  $\frac{2}{3}$  webbed, the web reaching the disks of all but the 4th, up which it extends as a narrow fringe almost to the disk; subarticular tubercles small and by no means prominent; a very small and indistinct internal metatarsal tubercle; no external metatarsal tubercle; a narrow serrated fringe on the 5th toe and a less distinct serrated ridge running along middle of ventral surface of shin.

*Colouration*.—Back grey with black spots; the larger warts buff; the tympanum black; a large black and white diversified patch on each side between the two fore and hind limbs and a white patch in the axilla; external surface of thigh irregularly banded and marbled with black, white and grey; ventral surface

<sup>1</sup> *Ann. Mus. Genova* (2nd ser.), xiii, p. 342, pl. xi, fig. 1.

black with a faint vermicular reticulation running all over the body and onto the ventral surface of the thighs.

*Habitat*.—Upper Renging (alt. 2,150 ft.): 5-10-ii-12.

*Types* (two adults). Nos. 16951 and 16952: presented by Capt. the Hon. M. de Courcy.

The circumstances in which these frogs and their tadpoles were found are of considerable interest. Capt. de Courcy writes about them as follows:—

"[The frogs were taken] between Upper Renging and the Vernu Kotal . . . . It was a few yards this side of Prospect Col that some of my men found the new *Phrynoderra* frogs—3 of them, under a log—and kept them, trying to make me see them among some lumps of earth—almost an impossibility. One escaped a few minutes after I had taken them over, and while I was standing there, the men cut off a big bit of the same log, the usual old felled tree on a *jhoom* [clearing], and rolled it down on to the road. Some water gushed out of a hole and I saw the tadpoles wriggling about on the ground and collected all I could."

The tadpoles, which are described below (p. 25), evidently belong to the same species as the adult frogs, for one of them has progressed far in its metamorphosis and has begun to develop the characteristic ridge-like warts on the back.

#### Fam. BUFONIDAE.

##### 22. *Bufo melanostictus*, Schneid.

A typical specimen of this toad was taken by Mr. Kemp at Dibrugarh in the middle of November and on the same date he found a number of tadpoles in which the hind limbs were not developed.

##### 23. *Bufo himalayanus*, Günth.

*Bufo melanostictus* var. *himalayanus*, Günther, *Rept. Brit. Ind.*, p. 442.

*Bufo himalayanus*, Boulenger, *Fauna*, p. 505.

I am inclined to agree with Dr. Günther in regarding this form merely as an Alpine race of *B. melanostictus*. The greatest difficulty is often experienced in separating specimens and quite typical individuals of *B. melanostictus* are often found at considerable altitudes in the Himalayas. Almost every gradation between the two forms can be found. Tadpoles (plate iv, fig. 7), however, from above 4,000 ft. in the E. Himalayas can, so far as my experience goes, be distinguished from those found in the plains of India by the fact that the eyes are not prominent but rather sunken. Tadpoles from the plains agree well with one from the Malay Peninsula figured by Flower (*P.Z.S.*, 1896, p. 911, pl. xliv, fig. 3), and I have found similar specimens at an altitude of over 7,000 ft. in the W. Himalayas near Naini Tal.

Mr. Kemp obtained four toads at Kobo in November and December, which I assign to Günther's "variety" with some

doubt. Their tympana are smaller than is usually the case in *B. melanostictus* and in two of them are also somewhat obscured. The parietal ridges are absent in one specimen and in the others, although they are present, they are very indistinct.

Fam. PELOBATIDAE.

The genus *Megalophrys* is represented in the collection by tadpoles which seem to belong to at least two species and also by a single small frog, which I have accepted as the type of a new species. The tadpoles are discussed below (p. 28).

25. *Megalophrys kempii*, sp. nov.

(Plate iii, fig. 5.)

Although the only specimen obtained is very small, I am inclined to think from its general appearance that it is at least sub-adult. The species is clearly related to *M. heteropus* (Boulenger),<sup>1</sup> but the snout is rather longer, the tympanum larger and the hind legs longer.

*Habit* slender. Length (of type) from snout to vent 15 mm.

*Head* moderate, little depressed; snout longer than eye, sloping forwards above, rounded at the tip, truncate vertically, projecting very little beyond lower jaw; nostril much nearer tip of snout than eye; canthus rostralis distinct; loreal region concave, nearly vertical; interorbital distance much greater than width of upper eye-lid; tympanum fully exposed, nearly as large as eye, close to which it is situated.

*Mouth*.—No vomerine teeth; tongue slightly cleft behind.

*Skin* of back, limbs, throat and chest smooth, of belly obscurely granular; some irregular tubercles on the base of the thighs. No dorso-lateral or supratympanic folds.

*Limbs* slender. Fingers short, free, bearing (except the first, which is merely blunt) very small but distinct disks; first finger shorter than second; lower surface of hand smooth; subarticular tubercles poorly developed; no metacarpal tubercles. Hind limb long; the tibio-metatarsal articulation reaches the tip of the snout; toes slender, the fourth very long, with small disks and the rudiments of a web; subarticular tubercles poorly developed; no metatarsal tubercles; no tarsal fold.

*Colouration*.—Dorsal surface dark olive with more or less symmetrically arranged greyish green marks; upper surface of snout of latter shade; hind limbs obscurely banded with dark olive; ventral surface yellowish, suffused with dark olive; throat densely powdered with that shade but ornamented with clear yellowish spots.

*Habitat*.—Upper Rotung (2,000 ft.): 1-1-12.

*Type*.—No. 17013 in Indian Museum register of Reptiles and Batrachia.

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<sup>1</sup> *Ann. Mag. Nat. Hist.*, (7), vi, p. 186 (1900), and *P.Z.S.*, 1908 (1), p. 422, fig. 2.

## (b) TADPOLES.

The tadpoles here discussed are those of :—

- |                                     |                                   |
|-------------------------------------|-----------------------------------|
| A. <i>Rana liebigii</i> ,           | D. <i>Rhacophorus maculatus</i> , |
| B. <i>Rana alticola</i> ,           | E. <i>Phrynoderma moloch</i> ,    |
| C. <i>Rana afghana</i> ,            | F. An unidentified Ranid,         |
| G. and H. <i>Megalophrys</i> , spp. |                                   |

## Fam. RANIDÆ.

A. Larva of *RANA LIEBIGII*, Günth. (Plate iv, fig. 2.)

Annandale, *J.A.S.B.*, 1906 (2), p. 290.

The tadpole of this species is very abundant in small jungle streams in the neighbourhood of Kurseong (4,000—5,000 ft.), E. Himalayas, both in April and May and in July, August and September. Mr. Kemp obtained two specimens in a small stream on the east side of the Dihang R. near Yembung between the 13th and the 17th of January. Their hind legs were just beginning to appear.

The larva of *R. liebigii* may be redescribed as follows :—

*Head and body* feebly arched above but not quite flat, sloping slightly from behind forwards, convex on ventral surface, broadly ovoid as seen from above; the tip of the snout rounded.

*Mouth* ventral; lips broad but not excessively so, directed inwards and enclosing a considerable cavity; posterior lip directed backwards, anterior lip forwards and inwards, thus forming a vestibule to the mouth; lower lip with a complete double row of rather elongate tubercles; upper lip fringed with a single row of rather smaller tubercles which is widely interrupted in the middle; dental formula usually  $2: 5+5 | 1+1: 2$ ,<sup>1</sup> sometimes three uninterrupted rows of teeth present on the upper lip; neither upper nor lower beak divided; both horseshoe-shaped and minutely serrated; upper lip very narrow.

*Nostril and eye* small, by no means prominent; the former situated midway between the eye and the tip of the snout; eye directed obliquely upwards, situated at the junction of the dorsal and the ventral surfaces, much nearer the tip of the snout than the base of the tail.

*Glands*.—None apparent.

*Spiracle* sinistral, pointing backwards and slightly upwards, small, circular, not markedly tubular.

*Vent* dextral.

*Tail* gradually pointed, tapering, twice as long as head and body; its greatest depth  $\frac{1}{5}$  of total maximum length; fin-mem-

<sup>1</sup> For convenience in printing this and other dental formulae in this paper are printed in a somewhat novel form. The figures to the right of the central dark vertical line represent the tooth-rows of the upper, those to the left of this line the tooth-rows of the lower lip. The colons merely separate the number of undivided from that of divided rows.

branes well developed for its whole length both above and below the muscular portion; the greatest depth twice that of the muscular portion.

*Colouration* somewhat variable; dorsal surface brownish, marked in some individuals with yellow; fin-membrane pale, with large dark pigment-cells which in some individuals tend to be arranged in vertical bars; a dull yellowish mid-dorsal streak sometimes present at base of tail; spiracle surrounded by a white ring.

*Dimensions* of an individual in which the hind legs are beginning to appear.

Total length ..	..	..	44 mm.
Length of head and body ..	..	..	15 ,,
Length of tail ..	..	..	29 ,,
Maximum breadth of body ..	..	..	12 ,,
Maximum depth of body ..	..	..	10 ,,
Maximum depth of tail ..	..	..	12 ,,

Full-grown tadpoles measure about 56 mm. in length.

#### B. Larva of *RANA ALTIOLA*, Boulgr. (Plate iv, fig. 1.)

Boulenger, *Cat. Batr. Sal. Brit. Mus.*, p. 62, fig.; Annandale *P.Z.S.*, 1905 (1), p. 58, pl. vi.

The tadpoles figured and described by Mr. Boulenger were evidently badly preserved and faded. I have, therefore, re-described this larva from well-preserved and recently captured specimens.

*Head and body* flattened both above and also on the anterior part of the ventral surface, oval, truncate anteriorly.

*Mouth* ventral; lips well developed, the posterior lip directed backwards, not excessively broad, with a single row of rather small tubercles running all along its margin; anterior lip directed forwards and inwards, fringed for rather less than a third of its length on either side and bearing on its ventral surface in the same region numerous small tubercles, bare in the middle. Dental formula  $2 : 5+5 \mid 1+1 : 8$ , the outer row of teeth on the posterior lip feebly developed; beak in two parts, an upper and a lower; both parts roughened on the surface but not serrated at the margin; upper part crescentic, projecting slightly in the middle; lower part broadly V-shaped.

*Nostril and eye* small, by no means prominent; the former in well-preserved specimens rather nearer the eye than the tip of the snout; eye directed obliquely upwards, situated near the dorsal surface, much nearer the snout than the base of the tail.

*Spiracle* sinistral, tubular, directed outwards and a little upwards.

*Vent* dextral.

*Glands.*—A large and prominent oval parotoid gland<sup>1</sup> present on each side and a small and less conspicuous single gland (in large tadpoles) on the dorsum at the base of the tail.

*Tail* bluntly pointed, about  $1\frac{1}{3}$  times as long as head and body, very shallow at its base owing to poor development of both fin-membranes; these become deep shortly afterwards and then diminish again somewhat abruptly, so that the outline of the tail is strongly sinuous.

*Colouration.*—In the young tadpole the head and body are boldly diversified with dark and pale markings not of a symmetrical nature, while the muscular part of the tail bears numerous large and small ocelli, which are replaced on the fin-membranes by small black spots. As the tadpole grows and the limbs begin to develop the colours darken and the caudal ocelli become indistinct or disappear, with the exception, as a rule, of one large ocellus on each side at the base of the tail. Sometimes a second smaller and more distal ocellus also persists and occasionally there is a row of ocelli all along the tail of even full-grown larvae, gradually diminishing in size from in front backwards. The central spot of each ocellus is black, the outer ring yellow. The number of ocelli is not always the same on both sides of the body.

*Dimensions.*—The tadpole reaches a length of at least 57 mm. The following are the measurements of two specimens in one of which (A) the hind limbs appear as minute buds, while in the other (B) the toes can just be detected:—

	A (tail injured).	B.
Total length ..	.. — mm.	42 mm.
Length of head and body ..	27 ,,	18 ,,
Length of tail ..	— ,,	24 ,,
Maximum breadth of body ..	16 ,,	10 ,,
Maximum depth of body ..	14 ,,	9 ,,
Maximum depth of tail ..	16 ,,	9 ,,

I was at first inclined to adopt the opinion that the large series of ocellate Ranid larvae in our collection represented two distinct species, one with a distinct supra-caudal gland, prominent parotoids and not more than two ocelli on each side of the tail, the other with no supra-caudal gland, much less prominent parotoids, the head and body spotted and mottled, and numerous caudal ocelli. Specimens, however, recently obtained by Mr. F. H. Gravely and Capt. R. B. Seymour Sewell, I.M.S., in Lower Burma, show that there is a complete gradation between the two forms, the latter being merely a younger stage of the former. Mr. Gravely's specimens, in none of which were the hind limbs developed, were taken in a small pond near Kawkareik in

<sup>1</sup> This gland is not nearly so conspicuous in fresh specimens as it is in old and faded ones.

November and Capt. Sewell's, which were in a slightly more advanced stage of development, on the coast of Tavoy in spring. A young frog which had already assumed the green back of the adult was taken with Mr. Gravely's tadpoles.

C. Larva of *RANA AFGHANA* (Gunth.). (Plate iv, fig. 3.)

? *Rhacophorus reinwardtii* (larva), Boulenger, *Cat. Batr. Sal. Brit. Mus.*, p. 89, fig.  
*Rana aghana*, *id.*, *Ann. Mus. Genova* (2nd ser.), v, p. 420 (1883), and *P.Z.S.*, 1893, pp. 526, 527.

Mr. Boulenger has given an excellent description of this larva in the "Annali" of the Genoa Museum and has also published a key whereby those tadpoles of the genus *Rana* which are provided with large ventral suckers may be distinguished from one another. This key is in the *P.Z.S.* for 1893.

Mr. Kemp obtained two tadpoles that agree well with Mr. Boulenger's description in a small stream running into the Dihang R. near Yembung in January. Their hind limbs have not yet appeared. An adult *R. aghana* was taken at the same place in the same month.

D. Larva of *RHACOPHORUS MACULATUS* (Gray).

(Plate iv, figs. 4, 5.)

*Rhacophorus leucomystax*, Flower, *P.Z.S.*, 1896, p. 906, pl. xliv, fig. 2, and 1899, p. 898, pl. lix, figs. 3, 3a; Butler, *Journ. Bombay Nat. Hist. Soc.*, xv, p. 202.

*Rh. maculatus*, Ferguson, *ibid.*, p. 504, pl. B, fig. 4.

Captain Flower, in the first of the two papers cited after his name, describes and figures the tadpoles of the Malay race (*leucomystax*) of this species, his specimens being from Singapore. In his second paper he does the same for tadpoles from Bangkok, which seem to differ in more than one particular from those of the Malay race. I propose here to describe those of the Himalayan and the Peninsular races—the latter from specimens taken in September in Orissa, the former from tadpoles caught in the neighbourhood of Darjiling and identified after breeding out several individuals from the same lot in Calcutta. In both cases the tadpoles were taken in pools of rain-water.

i. Tadpoles of Himalayan race (*himalayensis*).

*Head and body* moderately flat above, ovoid, rounded in front, convex on ventral surface.

*Mouth* nearly terminal, comparatively small; lips relatively narrow, both directed forwards; upper lip smooth except at the corners, which bear numerous rounded papillae; lower lip with a fringe interrupted in the middle, and consisting of similar papillae about three deep; dental formula 1: 3+3 | 1+1: 2 or 1: 3+3 | 3; beak in two parts; the upper beak not hooked, the lower crescentic; both parts massive, both serrated.

*Eye and nostril.*—Eye lateral, directed outwards; nostril nearer tip of snout than eye.

*Glands.*—There is a large gland in front of and slightly below each eye.

*Spiracle sinistral*, pointing backwards and a little upwards, flap-like, large.

*Anus dextral.*

*Tail* long and slender, about twice as long as head and body, sharply pointed; its outline not strongly sinuous; fin-membranes deep throughout its length.

*Colouration.*—Mottled with dark brown on dorsal surface and sides; fin-membranes minutely spotted; ventral surface white.

*Dimensions.*—The following are the measurements of a tadpole with well developed hind legs (A) and of one in which the hind legs are just about to appear (B):—

	A.	B.
Length ..	.. 62 mm.	33 mm.
Length of head and body ..	.. 20 ,,	12 ,,
Length of tail ..	.. 42 ,,	21 ,,
Maximum width of body ..	.. 13 ,,	8 ,,
Maximum depth of body ..	.. 10 ,,	7 ,,
Maximum depth of tail ..	.. 14 ,,	8 ,,

## 2. Tadpole of Peninsular Indian race (*maculatus*).

The larvae of this race differ from those of the Himalayan race in the following points:—

- i. The head and body are flatter above.
- ii. The lips are even narrower.
- iii. The habit is more slender and the dimensions less.
- iv. The colour is very pale brown or green with scattered pigment-cells of a darker shade on the back and sides.

Both races apparently differ from the Malay one in having the outline of the tail less strongly sinuous and in colouration. In all essential structural characters, however, they are identical. Ferguson's Travancore tadpoles differed slightly in colouration from my Orissa ones. The breeding season in Travancore lasts, according to that author, from June to November; both in the E. Himalayas and the plains of Lower Bengal, it is in progress in July, August and September. I have never seen the tadpoles of either race in running water. The eggs in their frothy covering are usually laid at the edge of small pools.

## E. Larva of PHRYNODERMA MOLOCH, sp. nov. (Plate iv, fig. 6.)

The tadpoles are very like those of *Ixalus horridus*, Blgr.<sup>1</sup>, but have a longer and more pointed tail, and when full-grown

<sup>1</sup> Report on the Reptiles in Annandale and Robinson's *Fasciculi Malayenses*, i, p. 139, pl. vi, figs. 2a, 2b (1902).

develop the characteristic dorsal rugosities of the adult before the fore-legs break through.

*The head and body* are flattened and broadly oval, being only a little longer than broad. The tail as a whole tapers gradually and is nearly twice as long as the head and body. The colour is an almost uniform black or dark grey, except that the margins of the lips are white and the lower surface slightly paler than the dorsal. At the time at which the hind limbs begin to sprout out the skin is still quite smooth, but as they develop ridge-like warts appear on the dorsal surface. There are numerous little sensory pits arranged in lines on the head and body.

*Mouth* subterminal, small; its lips by no means strongly developed. The margin of the upper lip for the most part smooth but with a few conical tubercles where it joins the lower lip, the margin of which is completely fringed with a double row of similar tubercles. The dental formula is  $1: 3+3 \mid 3$ , the first interrupted row of teeth being much longer than the other two. The beak consists of an upper and a lower part each of which is undivided; both are rather narrow; the anterior is narrowly crescentic in form, while the posterior is deeply excavated in the middle; neither has a concavity on the exposed surface and both are minutely serrated.

*Nostril and eye* small, dorsal, directed upwards, by no means prominent. The internasal space is about  $\frac{2}{3}$  the interorbital and  $\frac{1}{2}$  that between the nostril and the eye; the nostril is equidistant from the tip of the snout and the eye.

*Sensory pits*.—On the dorsal surface of the head and body four longitudinal lines of minute white pits can be distinguished, two on either side of the middle line. Two on each side start close together on the snout and after diverging in a sinuous manner so as to include between them a nostril and an eye meet together behind the latter. On the ventral surface there are three backwardly concave transverse lines, one just behind the mouth and two, the corner of which is somewhat sinuous, posterior to it. There is also a lateral line of pits along the muscular portion of the tail and a row of larger, isolated ones along the upper fin-membrane.

*Spiracle* sinistral, large and patent, directed backwards and situated somewhat low down on the side.

*Vent* in the middle line.

*Tail*.—The muscular portion is slender and tapers to a fine point. In the middle part of the tail the membrane equals it in depth both above and below, but at the base the membrane is shallow on both sides.

*Dimensions* of an individual with well-developed hind limbs (A) and of one (B) in which they have just begun to sprout:—

	A.	B.
Total length ..	.. 58 mm.	55 mm.
Length of head and body ..	20 ,,	17 ,,
Length of tail ..	38 ,,	38 ,,

	A.	B.
Maximum breadth of body ..	16 mm.	13 mm.
Maximum depth of body ..	11 ,,	9 ,,
Maximum depth of tail ..	10 ,,	12 ,,

*Habitat*, etc.—Four tadpoles were taken by Capt. de Courcy near Upper Renging between the 5th and the 10th of January, 1912. They were in a small pool of rain-water inside a log of rotten wood and were accompanied by two adults, the types of the species. There can be no doubt as to their identity, for the largest tadpole has already begun to develop the characteristic features of the adult. It has the hind limbs well developed.

#### F. UNDETERMINED RANID LARVA. (Plate iv, fig. II).

A number of large Ranid larvae were taken on the 9th and 16th of January in the Egar stream between Renging and Rotung by Mr. Kemp and Capt. de Courcy. Specimens of *Rhacophorus naso*, *Ixalus asper* and *I. tuberculatus* were taken with one of them, and also several *Megalophrys* tadpoles. Mr. Kemp suggests that they may be the larvae of one of the adults captured on the same occasion and they may well be that of a *Rhacophorus*. There is, however, no direct evidence as to their parentage and none of them have reached a stage in their metamorphosis that would render it possible to throw any definite light on the subject. It may be as well to describe them, however, as they present certain features of biological interest. There can be no doubt that they are specifically identical.

*Head and body* convex above, flattened on the ventral surface, ovoid, snout bluntly rounded, projecting.

*Mouth* ventral, very large with both lips highly developed and the lower lip directed backwards and of unusual size; upper lip not fringed except at the corners; lower lip extending backwards for some distance behind the last row of teeth and covered in this region with relatively large rounded tubercles, also completely fringed with smaller and more elongate tubercles; dental formula  $2+2: 1: 5+5 \parallel 1+1: 2$ ; the outermost row of teeth on each side of the upper lip curving upwards and inwards to the margin of the lip which it reaches near the middle without meeting its fellow of the opposite side; beak stout, in two parts; the upper part having a flattened, nearly triangular area in the middle of the free margin; this area separated from the rest of the upper beak by a minutely serrated ridge which is in continuity with the edge of the beak on either side; the lower beak broadly V-shaped, minutely serrated on the margin.

*Nostril and eye* by no means prominent, of moderate size; eyes lateral but near the dorsal surface, directed outwards and upwards; nostril nearer eye than tip of snout.

*Glands*, etc.—No very definite glands can be detected but there are numerous little pits arranged along the upper lip, in a

line extending from near the tip of the snout upwards outside each nostril to the eye, round the eye and in two patches behind it.

*Spiracle sinistral*, large and tubular, pointing directly backwards.

*Tail* rather more than twice the length of the head and body, stout, with both fin-membranes well developed throughout its length.

*Dimensions* of tadpoles without hind limbs.

Total length .. ..	..	76 mm.
Length of head and body .. ..	..	25 "
Length of tail .. ..	..	51 "
Maximum width of body .. ..	..	16 "
Maximum depth of body .. ..	..	15 "
Maximum depth of tail .. ..	..	18 "

*Colour* an almost uniform dark brown; fin-membranes and ventral surface a little paler.

There can be no doubt that the lips form in this species a powerful sucker, as they do even in such tadpoles as that of *Rana liebigii*. It is the largest Indian tadpole with which I am acquainted.

Fam. PELOBATIDAE.

G. H. Larvae of *MEGALOPHRYNS* spp. (Plate iv, figs. 8, 9, 10).

Weber, *Ann. Jard. Bot. Buitenzorg*, xv, suppl. ii, p. 5, 1898;  
Laidlaw, *P.Z.S.*, 1900, p. 889; Gadow, *Camb. Nat. Hist. Amphib. and Rept.*, p. 60, fig. 11; Boulenger, "Report on the Reptiles," *Fascic. Malay.*, Zool., i, p. 131; Annandale, *ibid.*, p. 275, fig. 1; van Kampen, *Natuurk. Tijd. v. Ned.-Ind.*, lxix (1), p. 27; Boulenger, *P.Z.S.*, 1908 (1), pp. 413, 426.

It has been pointed out by Mr. Boulenger and other authors that the larvae of the Oriental genus *Megalophryns* fall into two groups one of which resembles the larvae of European Pelobatidae and is in no way remarkable, while the other is distinguished from all other known tadpoles by the peculiar structure of the mouth. It is with the latter group that I am at present concerned.

The first representative of this group to be described was *M. montana* (Kuhl), a species not uncommon in hilly districts of Java and the Malay Peninsula but not known to occur in the Indian Empire. This larva has frequently been described and I need only refer to its colouration. The whole of the body and tail are dark brown with paler markings along the sides. At altitudes of from 2,000 to 5,000 ft. in the E. Himalayas a tadpole of precisely similar structure is abundant in small jungle streams, but it differs in colouration in two particulars, firstly in that the ventral surface is much paler than the sides and secondly that there are dark instead of pale markings on the latter. These markings take the

form of irregular spots and veinings. I have found every stage in the metamorphosis of this tadpole into *M. parva*, Boulenger.

A second tadpole of identical structure but slightly different colouration, larger size and more slender form also occurs in the E. Himalayas and was taken in considerable numbers in the Abor foot-hills. It differs from that of *M. parva* in lacking the dark markings on the sides or at any rate in having them much less conspicuous and consisting only of minute spots. I believe that this larva, which I have seen from the N. Shan States, is that of *M. major*, Boulenger, but have only circumstantial evidence in support of this belief.

A fourth *Megalophrys* tadpole was taken by Mr. Kemp in the Abor foot-hills. It differs from the one I have assigned provisionally to *M. major* in being of an almost uniform dark brown colour both above and below. There is no evidence that this is the tadpole of *M. kempii*, but it may be stated that a very similar larva was taken by Mr. F. H. Gravely on the Siamese frontier of Tenasserim near the Dawna Hills in company with a young frog that apparently represents *M. heteropus* (Boulenger), a species hitherto known from the hills of the Malay Peninsula.

It is a remarkable fact that whereas the tadpoles of *M. haseltii* (Tshudi), a Malayan species, are of typical Pelobatid structure, those of other members of the genus from the same region are not only extremely different from that form but also extremely close to one another in structure. Were it not proved that the common Darjiling tadpole is the larva of *M. parva*, it would be difficult to believe that it was specifically distinct from that of *M. montana*, although there is no difficulty in distinguishing the adults. Seeing that these two larvae belong to different species, it is evident that the larva of other species must only be identified with great caution.

## PART II.—BIOLOGICAL.

Of all the frogs and toads taken in the Abor foot-hills only two (*Rana limnocharis* and *Bufo himalayanus*) entirely lack adhesive digital disks, and we may take it that the majority of the other species are normally arboreal in habits. Some few of them, however, seem rather to be rupicolous and to live among stones at the edge of streams. It is probable that *Micrixalus borealis* belongs to the latter category, but *Ixalus tuberculatus*, although individuals were actually found at the edge of a stream, is known also to frequent tree-trunks. *Phrynoderma moloch* apparently affects dead tree-trunks and lays its eggs in or near small masses of water that accumulate in them. In the dense jungles of the Malayo-Himalayan tract most of the Batrachia are as a rule arboreal and Mr. Kemp's collection in this respect is no exception. It may be noted, further, that the great majority of his specimens are protectively coloured and resemble either the lichen-clad bark of jungle trees or the green leaves of their foliage.

A very interesting set of biological phenomena is illustrated by the tadpoles of the Abor foot-hills, which agree precisely in this respect with those of the Darjiling district and of hilly districts in the Malay Peninsula. In the great majority of cases their structure is adapted for life in rapid-running mountain streams subject to sudden floods, and they are provided with special apparatus with which to contend against the dangers incidental to such a life. In other words, they possess special structural facilities either for clinging to fixed objects or else for floating away lightly on the surface of the flood.

There has been considerable dispute as to the function of the lozenge-shaped structure surrounding the mouth of the tadpole of *Megalophrys montana* and similar species. Dr. Gadow suggests that the peculiar teeth on the inner surface may be used for scraping the leaves of water-plants and Dr. van Kampen has observed the tadpoles rasping algae from the sides of a glass aquarium with them; but observations made in the Malay Peninsula, Burma and the Himalayas confirm me in the opinion, which was originally

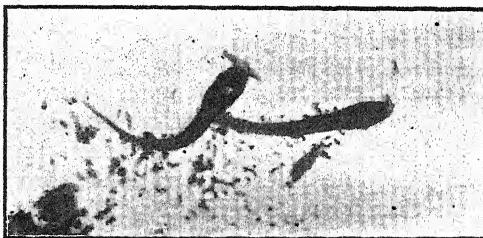


Fig. 1.—Tadpoles of *Megalophrys montana*.

advanced by Prof. Max Weber, that the chief function of the whole structure is to act as a float whereby the tadpole can be carried along on the surface, and also convince me that this function is correlated with the fact that floods are one of the chief dangers which tadpoles living in mountain streamlets have to fear. I reproduce above a photograph of two living tadpoles of *M. montana* taken some years ago in the Malay Peninsula. One of these tadpoles is lying at the bottom of the basin of water in which they were photographed and has the float folded, the other has it expanded on the surface. The water was too shallow for this tadpole's tail to hang vertically downwards as it usually does. Dr. Gadow's figure in the *Cambridge Natural History* is therefore more correct in this respect.

Although to act as a float is the main function of the oral apparatus of these *Megalophrys* tadpoles, and although the teeth on this apparatus are used for scraping off algae from stones (and, I think from an examination of the contents of their stomachs, also fungi from rotting wood), the apparatus has at least two other uses. In the first place it facilitates breathing when the tadpole

is lying among vegetable débris in the corner of little pools, and in the second it assists it to crawl over wet rocks and thus, perhaps, to reach a fresh pool if the one in which it is confined dries up during a period of drought. The first of these secondary functions only comes into play when the funnel is folded. As is shown in my figure in *Fasciculi Malayenses*, the mouth is well protected by the manner in which the lower part of the apparatus folds upwards over the upper part, but the lateral parts do not completely close together. Each margin bends inwards towards the other in such a way that on each side a narrow tube is formed down which water free from all but very minute fragments of débris is drawn to the mouth by the respiratory movements.

I have often observed the larvae of *M. parva* adhering to rocks at the edge of small streams in the E. Himalayas and even making their way up the faces of rocks in this position until at least the anterior part of the body was out of water. Adhesion was brought about very largely by the application of the outer surface of the lower part of the apparatus, which only bears teeth on the inner surface, to the face of the rock; but the ventral surface of the body was applied in the same manner, while the movements of the powerful tail thrust the animal upwards. A small fish (*Nemachilus rupicola*) common in the same little streams actually, as I have myself observed, makes its way over rocks from pool to pool in a very similar manner, adhering partly by means of the smooth skin of its belly and partly by means of its lips.

Other tadpoles which frequent the streams of the Himalayas, instead of allowing themselves to be borne away lightly on the surface of the flood, adhere to rocks at the bottom or sides of the stream and have been found firmly fixed even in the immediate vicinity of waterfalls. The majority of the species both of the Darjiling district and of the Abor foot-hills adhere mainly by means of their lips, the inner, tooth-bearing surface of which is applied to the rocks. It is for this reason that in these species the position of the mouth is much more nearly horizontal than it is in many other tadpoles and the lips themselves are more or less enlarged. In such forms as the larva of *Rana liebigii* the lips, although they are distinctly broader than in the typical *Rana* tadpole and are directed forwards and backwards respectively instead of both forwards, are not monstrously developed; but in other forms, such as the large unidentified Ranid larva described above, they attain enormous dimensions and form together a powerful sucker possibly rendered necessary by the large size and heavy build of their possessor, for even the lips of the tadpole of *R. liebigii* enable it to cling tightly.

In some other species a sucker quite separate from the lips and not homologous with the sucker that many young Batrachia larvae possess, is found on the ventral surface, doubtless for the same purpose. *Rana afghana* and several allied Himalayo-Malayan frogs have this sucker in their larval stage.

It is noteworthy that the means whereby the fishes of the streams of the Himalayas adhere to rocks are analogous to those adopted by the tadpoles which live in the same environment. *Nemachilus rupicola*, as has already been stated, clings to rocks by means of the smooth skin of its belly and of its enlarged lips, just as the tadpole of *Megalophrys parva* does; several other mountain Cyprinidae have their mouths modified in a manner that would suggest their being used in the same way as the lips of *Rana liebigii*, while *Discognathus lamta* certainly adheres to the bottom in rapid water very largely by means of its lips, which recall those of the unidentified Ranid tadpole of the Abor foot-hills. The Silurid genera *Pseudecheneis* and *Glyptosternum*, on the other hand, cling by means of a separate abdominal sucker as the tadpole of *R. afghana* does.

There can be no doubt that these are instances of convergence, and there is some evidence that even in the case of the tadpoles of mountain streams, the same method of adhering to fixed bodies in rapid running water has been acquired independently in some instances by different species. The lips of the tadpole of *Bufo penangensis*,<sup>1</sup> for example, appear to resemble closely those of the unidentified Abor larva, which must certainly be assigned to the Ranidae, and enlarged lips like those of *Rana liebigii* are found in different species the adults of which are by no means closely allied. It can hardly be that the adaptation of such tadpoles, striking as it is, has been brought about by genetic relationship between the different species that possess it. The adults of most of the Abor frogs and toads have developed adhesive disks on their fingers without being in all cases closely related to one another, and we must suppose that the development of special abdominal suckers or of greatly enlarged lips is a similar phenomenon due, directly or indirectly, to environment rather than to the possession of a common ancestry by animals which have undergone parallel evolution in one particular.

### PART III.—GEOGRAPHICAL.

#### GEOGRAPHICAL LIST OF THE SPECIES IN THE COLLECTION.

NAME.	SIKHIM.	ASSAM.	BURMA.	REMARKS.
RANA ..	X	X	X	Cosmopolitan.
1. <i>R. cyanophlyctis</i> ..	X	X	X	Throughout Oriental Region.
2. <i>R. liebigii</i> ..	X	X	X	..
3. <i>R. tigrina</i> ..	X	X	X	Almost all over Oriental Region.

<sup>1</sup> Flower, P.Z.S., 1899, p. 909.

NAME.	SIKHIM.	ASSAM.	BURMA.	REMARKS.
4. <i>R. limnocharis</i> ..	x	x	x	Even more widely distributed.
5. <i>R. alticola</i> ..	..	x	x	Also in N. W. Himalayas, Bengal and Orissa.
6. <i>R. granulosa</i> ..	..	x	x	Also in Yunnan; in Assam only N. of Brahmaputra.
7. <i>R. afghana</i> ..	x	x	x	Not in Afghanistan.
8. <i>R. gerbillus</i> * ..	..	..	..	..
MICRIXALUS ..	..	..	x	Hitherto regarded as peculiar to S. India and Ceylon.
9. <i>M. borealis</i> * ..	..	..	..	..
RHACOPHORUS..	x	x	x	Oriental Region, China, Japan, Madagascar.
10. <i>Rh. maximus</i> ..	x	x	..	..
11. <i>Rh. bimaculatus</i> ..	..	x	..	Only known hitherto from the Khasi Hills.
12. <i>Rh. naso</i> * ..	..	..	..	..
13. <i>Rh. microdiscus</i> * ..	..	..	..	..
14. <i>Rh. maculatus himalayensis</i> ..	x	x	x	Also in Yunnan.
15. <i>Rh. tuberculatus</i> ..	..	x	..	Not known S. of Brahmaputra.
IXALUS ..	x	x	x	S. India, Ceylon, E. Himalayas, Assam, Burma, Indo-China, Malaysia.
16. <i>I. asper</i> ..	..	..	x	Also in Malay Peninsula and islands.
17. <i>I. annandalei</i> ..	x	x	..	Not known S. of Brahmaputra.
18. <i>I. argus</i> * ..	..	..	..	..
19. <i>I. tuberculatus</i> ..	..	..	x	Described from the Chinese frontier of Burma.
CHIRIXALUS ..	..	..	x	Hitherto only known from Burma.

NAME.	SIKHIM.	ASSAM.	BURMA.	REMARKS.
20. <i>Ch. doriae</i>	..	..	x	..
PHRYNODERMA	..	..	x	Hitherto only known from Burma.
21. <i>Ph. moloch</i> *	..	..	..	..
BUFO	x	x	x	Almost cosmopolitan; not in Australia or Madagascar.
22. <i>B. melanostictus</i>	x	x	x	Throughout Oriental Region.
23. <i>B. himalayanus</i>	x	..	..	E. Himalayas only.
MEGALOPHRVS..	x	x	x	Damper parts of Oriental Region; not in S. India or Ceylon.
24. <i>M. major.</i>	x	x	..	..
25. <i>M. kempii</i> *	..	..	..	..

So far as the genera mentioned in the foregoing list are concerned, its most striking features are the number of species of *Ixalus* included and the fact that the allied Burmese genera *Chirixalus* and *Phrynoderma* are also represented. Until recently the genus *Ixalus*, which abounds in Burmese and Malay forms, was not known from any part of the Himalayas or Assam, and even now only one species has been proved to exist in the Himalayas, west of Bhutan, namely *Ixalus annandalei*, Boulenger.<sup>1</sup> It is probable that another species (*I. asper*) also occurs in the Nepal foot-hills, but, even so, the genus is characteristically non-Himalayan.<sup>2</sup> *Chirixalus* and *Phrynoderma* have hitherto been monotypic genera, as the former still remains, and have only been recorded from the Karin Hills.

The occurrence of the S. Indian genus *Micrixalus* in the Abor foot-hills is exactly parallel to that of the lacertilian genus *Salea*, a species of which has recently been described from the adjacent Dafla country.

We may analyse the list further as regards species in the following manner, dividing them into seven geographical groups:—

A. Species apparently endemic in the foot-hills

E. of Bhutan .. .. .. 7=28%

B. Forms found in the Himalayas, Assam and

Burma .. .. .. 5=20%

C. Species of very wide distribution .. 4=16%

<sup>1</sup> J.A.S.B., 1906 (2), p. 385.

<sup>2</sup> Cf. Blanford, Phil. Trans. Roy. Soc., xciv (B), p. 421 (1901).

D. Species known from Sikkim and from Assam S. of the Brahmaputra .. ..	$2=8\%$
E. Species hitherto only known from Assam ..	$2=8\%$
F. Species hitherto only known from Burma or Burma and Malaysia .. ..	$3=12\%$
G. Species only known from the Himalayas ..	$2=8\%$

Stated in this manner the figures show at a glance how very distinct the Batrachian fauna of the N. E. corner of Assam and the Abor foot-hills is from both of the Himalayan foot-hills W. of Bhutan and from that of the districts S. of the Brahmaputra. They also show, however, that there is considerably greater affinity in the latter direction than in the former, and it is by no means improbable that further research among the Batrachia of southern Assam will increase rather than diminish the resemblance. It is, moreover, noteworthy that one of the two purely Himalayan forms (*Bufo himalayanus*) represented in Mr. Kemp's collection of frogs and toads is of doubtful validity as a species and that specimens from the Abor hills do not agree in every respect with those from Darjiling.

Several of the species whose names occupy a place in Mr. Kemp's list were not taken actually in the foot-hills, but in the plains at their base. These species are the following:—*Ixalus assamensis* from group G; *Rana alticola* and *R. granulosa* from group B, and *Rana cyanophlyctis*, *R. tigrina* and *Bufo melanostictus* from group C. If we eliminate these names, we get the following numbers and percentages in the different groups:—

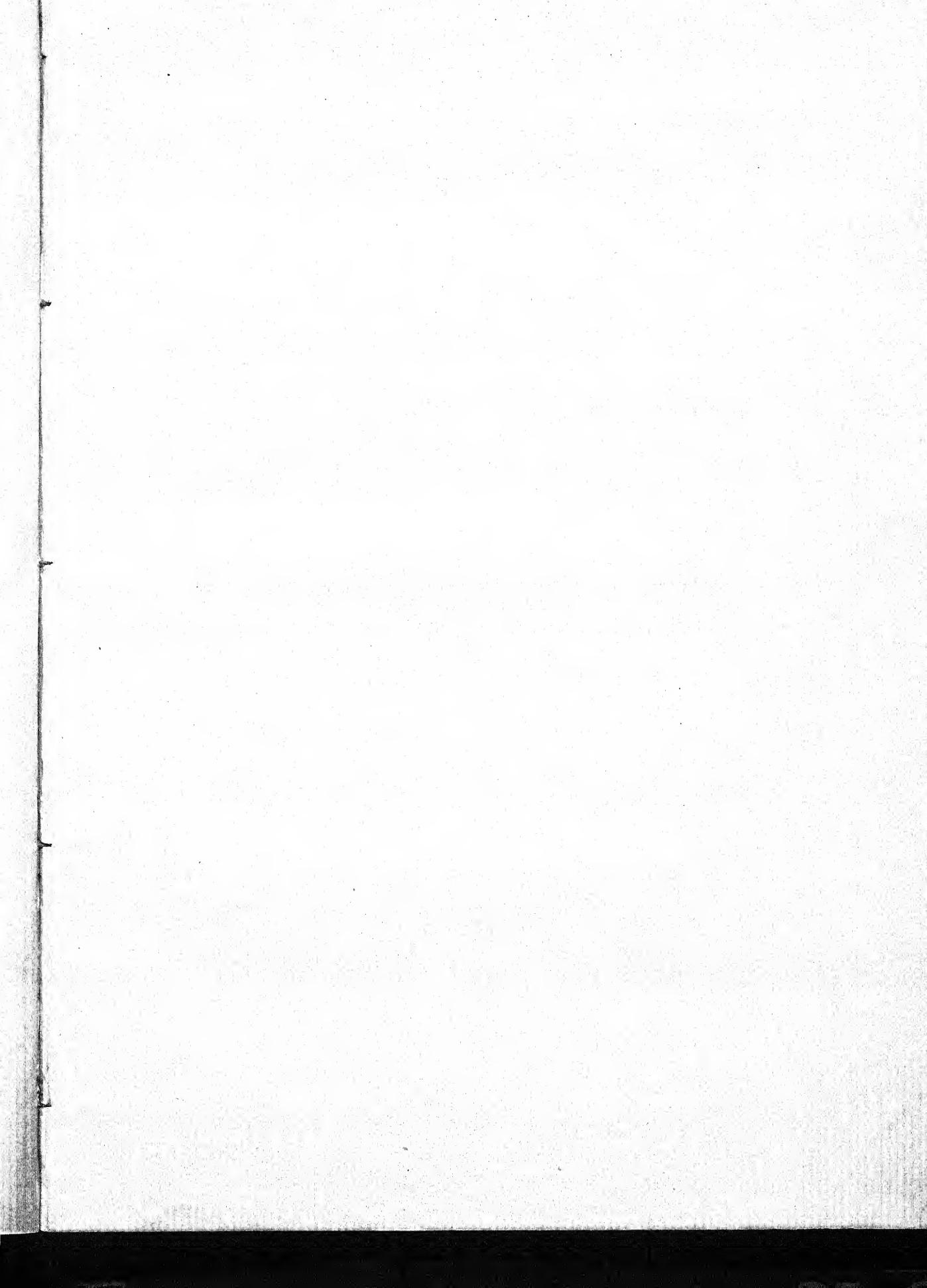
A. Species apparently endemic in the Himalayan foot-hills E. of Bhutan .. ..	$7=37\%$
B. Species from the Himalayas, Assam and Burma .. .. ..	$3=16\%$
C. Species of very wide distribution .. ..	$1=5\cdot25\%$
D. Species from Sikkim and from Assam S. of the Brahmaputra .. ..	$2=10\cdot5\%$
E. Species hitherto known only from Assam ..	$2=10\cdot5\%$
F. Species hitherto known only from Burma or from Burma and Malaysia .. ..	$3=16\%$
G. Species known only from the Himalayas ..	$1=5\cdot25\%$

These percentages, which are calculated roughly, show that the Batrachian fauna of the Abor foot-hills, in so far as it is illustrated by Mr. Kemp's collection, includes about 37% of apparently endemic species, about 16% of species that also occur both in Sikkim on the one hand and in Burma and Assam on the other and also of species hitherto known from Burma but not from Assam, about 10½% of species not known from Burma but common to the E. Himalayas and Assam and the same percentage of species only known hitherto from Assam, and about 5½% both of widely distributed species and of exclusively Himalayan forms. A true jungle fauna, if the jungle be of the damp equatorial kind, rarely

includes many species of Batrachia of a very wide distribution, and it is no exception to this rule to find that such forms are scarce in the Abor foot-hills; the large number of endemic species is a correlated fact. It is well known to be the case that the reptiles and Batrachia of the E. Himalayas, Assam and Burma have a strong affinity, and it seems probable that a rich Malayan element has made its way northwards and westwards into the damp evergreen jungles of these countries, gradually becoming more and more attenuated as the climate grows drier and less equable towards the west.

All the evidence at present available, therefore, supports the view that the fauna of the extreme eastern part of the Himalayan foot-hills is not, at any rate so far as the frogs and toads are concerned, Himalayan in the sense in which the term has hitherto been understood, but allied rather to the fauna of Assam south of the Brahmaputra or even to that of Burma. In other words, Blanford's "Eastern Himalayan Tract" does not extend, so far as the Batrachia are concerned, nearly so far to the east as he believed, while his "Assam Tract" extends northwards to include the foot-hills north of the Brahmaputra as well as its upper valley and the mountains lying south of it. It is probable also that no very clear line of division exists between his "Assam Tract" and his "Upper Burma Tract."

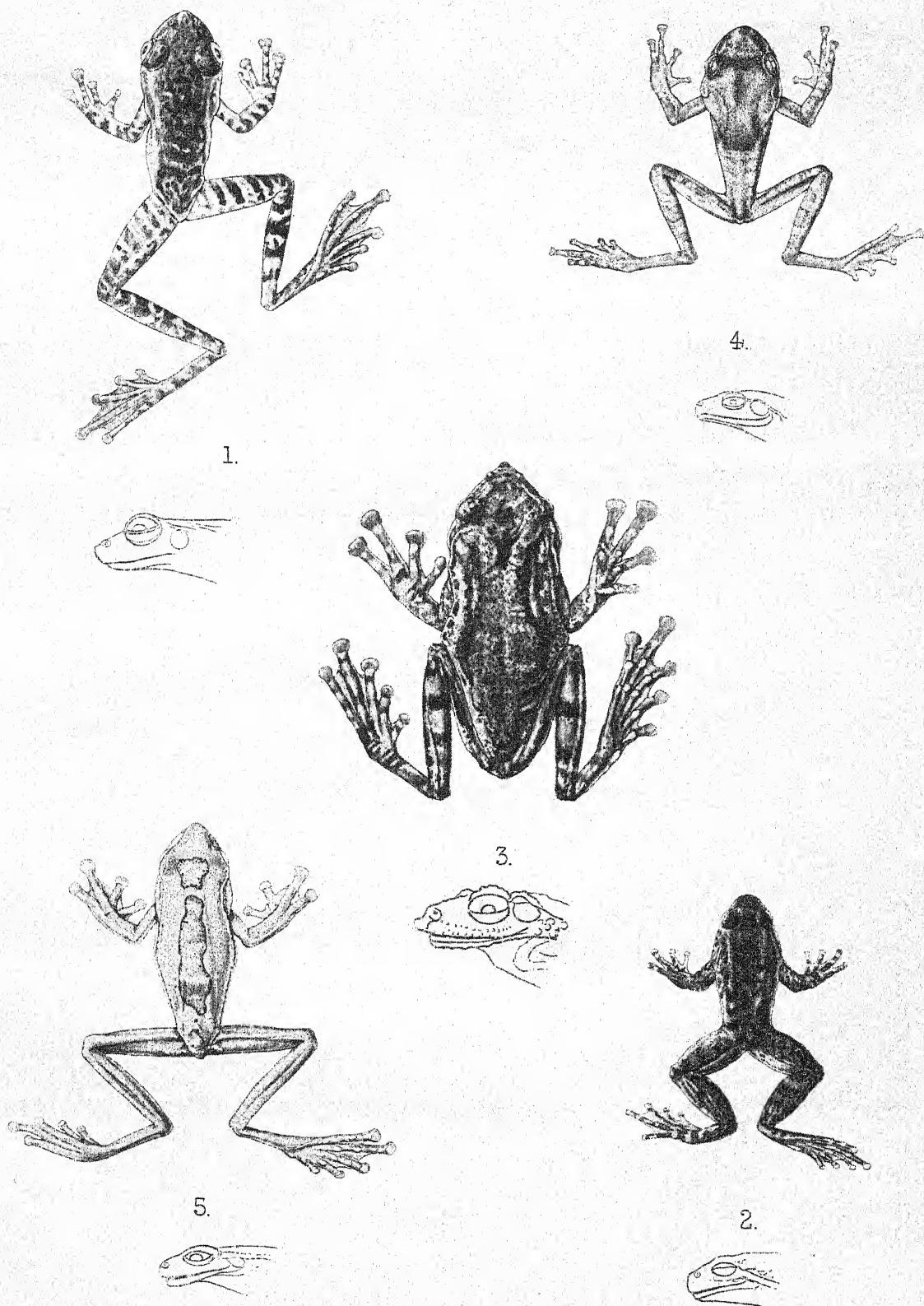
In conclusion I must thank Mr. Kemp for the very careful way in which his collection was preserved and labelled, and also those who helped him, especially Capt. the Hon. M. de Courcy, for the interesting specimens they contributed.



EXPLANATION OF PLATE II.

ABOR BATRACHIA.

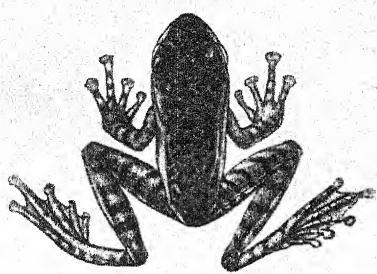
- FIG. 1.—*Rana gerbillus*,  
sp. nov. 1a. Profile of head. (From type).  
,, 2.—*Micrixalus borealis*,  
sp. nov. 2a. , , , (From co-type).  
,, 3.—*Rhacophorus naso*,  
sp. nov. 3a. , , , (From type).  
,, 4.—*Rhacophorus microdiscus*,  
sp. nov. 4a. , , , (From type).  
,, 5.—*Rhacophorus tuberculatus*,  
Anderson. 5a. , , ,



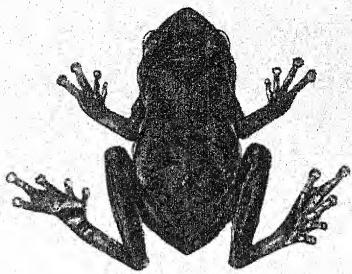
## EXPLANATION OF PLATE III.

### ABOR BATRACHIA.

- FIG. 1.—*Ixalus tuberculatus*,  
Anderson. 1a. Profile of head.  
,, 2.—*Ixalus annandalei*,  
Boulgr. 2a. ,, , (×2).  
,, 3.—*Ixalus argus*, sp. nov. 3a. ,, , (From type).  
,, 4.—*Phrynoderma moloch*,  
sp. nov. 4a. ,, , (From co-type).  
,, 5.—*Megalophrys kempfii*,  
sp. nov. 5a. ,, , (From type, ×2).



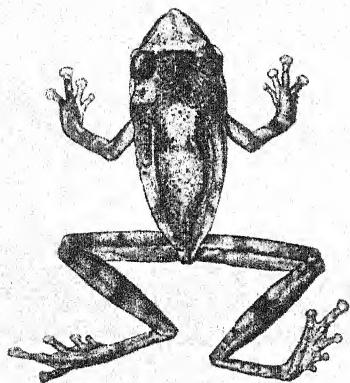
3.



1.



4.



2.



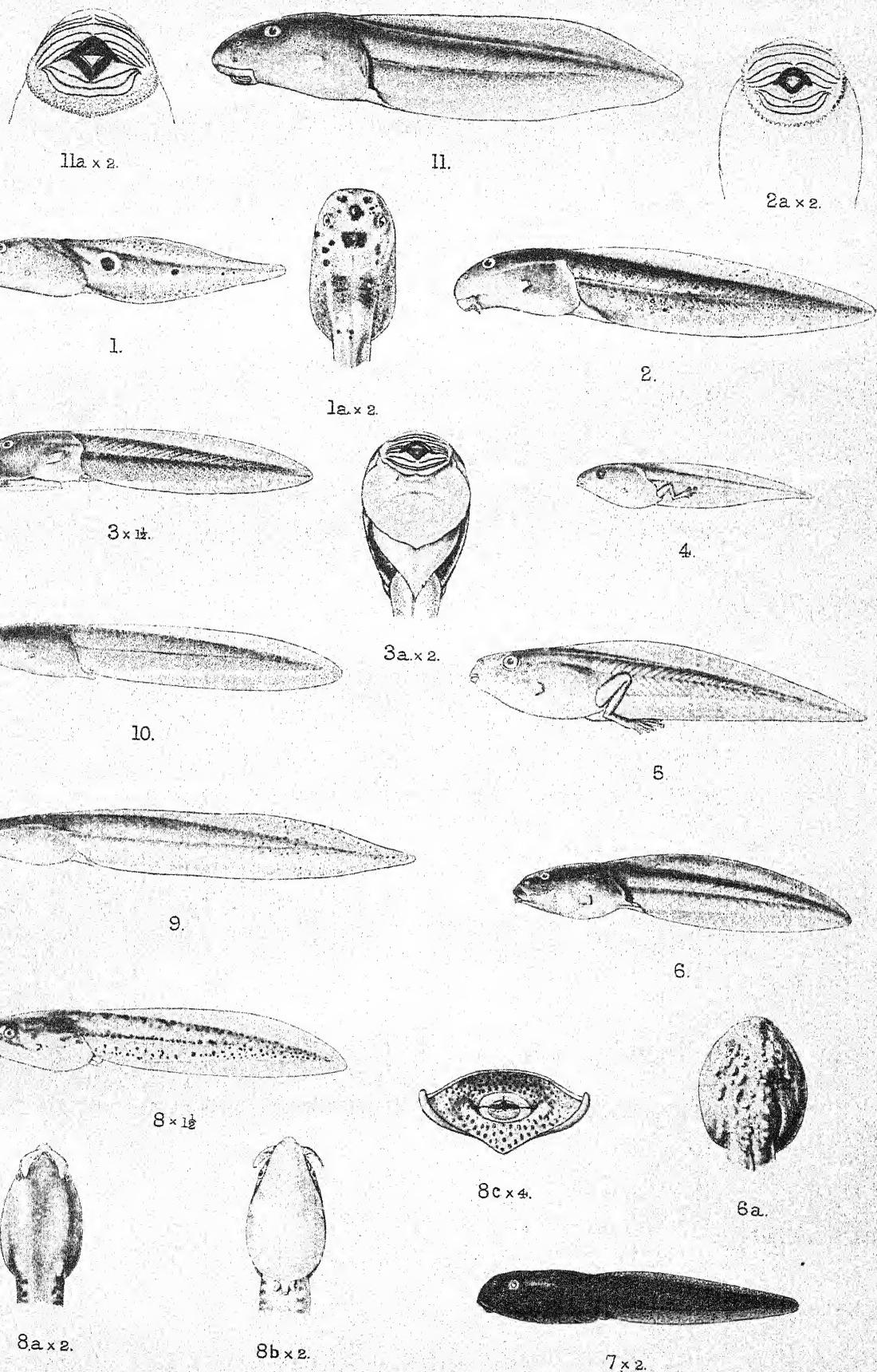
5.

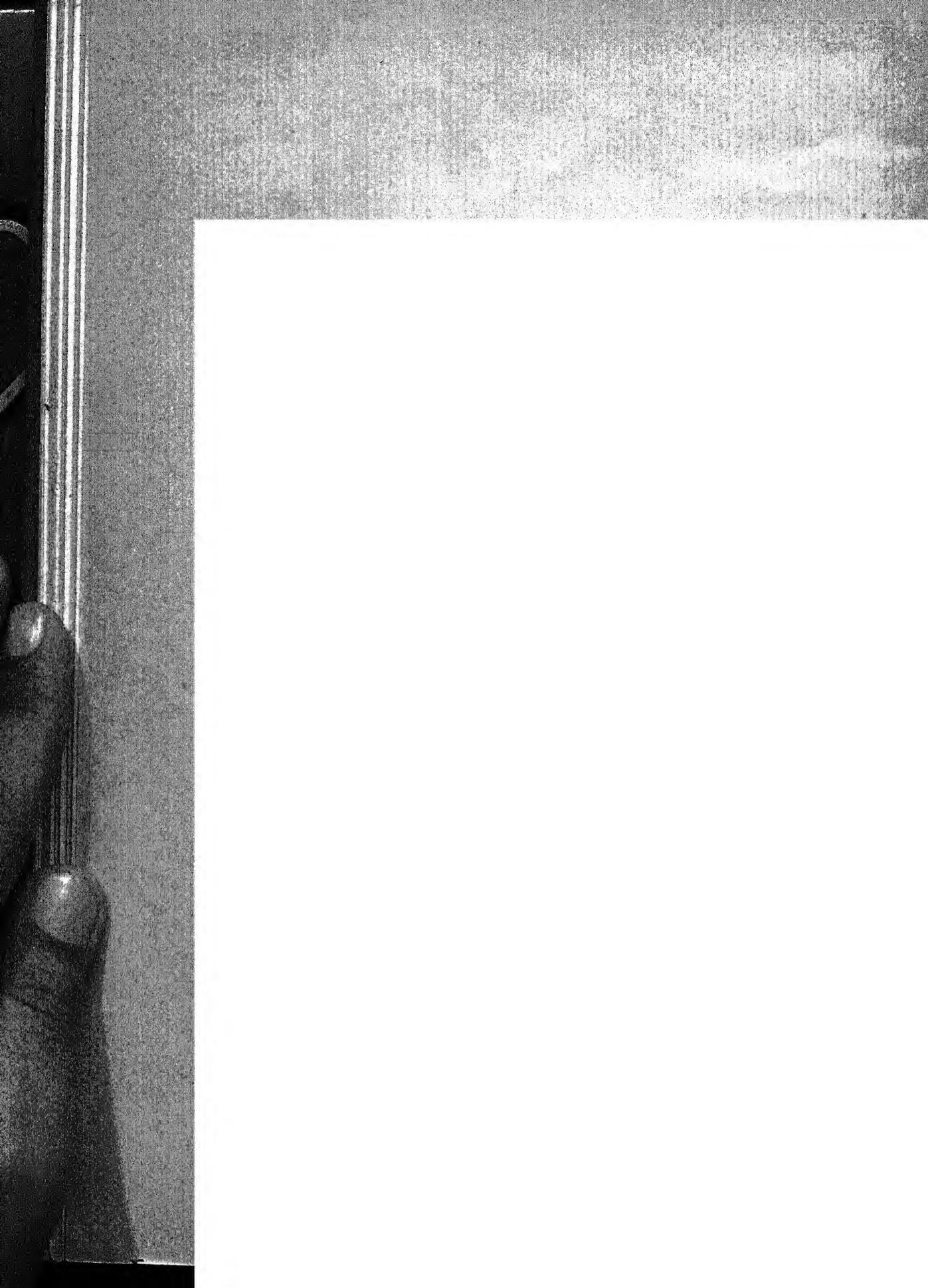


## EXPLANATION OF PLATE IV.

### HIMALAYAN TADPOLES.

- FIG. 1.—Tadpole of *Rana alticola*, Boulgr. 1a. Head of younger tadpole from above ( $\times 2$ ).  
,, 2.—Tadpole of *Rana liebigii*, Günth. 2a. Mouth of same ( $\times 2$ ).  
,, 3.—Tadpole of *Rana afghana* (Günth.) ( $\times 1\frac{1}{2}$ ). 3a. Mouth and ventral sucker of same ( $\times 2$ ).  
,, 4.—Tadpole of *Rhacophorus maculatus* (Gray), (typical form).  
,, 5.—Tadpole of *Rhacophorus maculatus himalayensis*, subsp. nov.  
,, 6.—Tadpole of *Phrynoderma moloch*, sp. nov. 6a. Head of larger tadpole from above.  
,, 7.—Tadpole of *Bufo himalayanus*, Günth. ( $\times 2$ ).  
,, 8.—Tadpole of *Megalophrys parva*, Boulgr. ( $\times 1\frac{1}{2}$ ). 8a. Head of same from above ( $\times 2$ ). 8b. Ventral surface of same ( $\times 2$ ). 8c. Mouth of same from in front ( $\times 4$ ).  
,, 9.—Tadpole of *Megalophrys* (?) *major*, Boulgr. ( $\times 1\frac{1}{2}$ ).  
,, 10.—Tadpole of *Megalophrys*, sp. indet. from Abor country ( $\times 1\frac{1}{2}$ ).  
,, 11.—Tadpole of undetermined Ranid from Abor country. 11a. Mouth of same ( $\times 2$ )





## II. REPTILIA.

(Plate v.)

By N. ANNANDALE, D.Sc., F.A.S.B., Superintendent,  
Indian Museum.

Although the reptiles brought back by Mr. Kemp are perhaps less interesting than the Batrachia, this is due solely to the fact that the reptiles of the eastern parts of the Indian Empire have been far more carefully studied than the toads and frogs. The collection consists of 83 specimens of snakes, representing 26 species (of which 3 have not previously been described); 40 specimens of lizards, representing 16 species (of which 1 is new), and a single tortoise; that is to say, 124 specimens in all, representing 43 species.

### PART I.—SYSTEMATIC.

#### LIST OF SPECIES COLLECTED OR OBSERVED.

##### EMYDOSAURIA.

1. *Gavialis gangeticus*.

##### CHELONIA.

2. *Kachuga tectum*.

##### LACERTILIA.

3. *Gymnodactylus khasiensis*.
4. *Hemidactylus frenatus*.
5. *Hemidactylus bowringii*.
6. *Hemidactylus brookii*.
7. *Hemidactylus platyurus*.
8. *Draco maculatus*.
9. *Ptyctolaemus gularis*.
10. *Acanthosaura minor*.
11. *Calotes versicolor*.
12. *Calotes jerdoni*.
13. *Ophisaurus gracilis*.
14. *Varanus bengalensis*.
15. *Tachydromus sexlineatus*.
16. *Mabuya macularia*.
17. *Lygosoma indicum*.
18. *Lygosoma courcynum*, nov.

##### OPHIDIA.

19. *Typhlops diardi*.
20. *Typhlops tephrosoma*.

21. *Typhlops diversiceps*, nov.
22. *Trachischium monticola*.
23. *Blythia reticulata*.
24. *Aproaspidops antecursorum*, gen. nov., sp. nov.
25. *Polydontophis collaris*.
26. *Ablabes porphyraceus*.
27. *Ablabes pavo*, nov.
28. *Ablabes frenatus*.
29. *Simotes albocinctus*.
30. *Oligodon erythrorachis*.
31. *Zamenis mucosus*.
32. *Coluber taeniurus*.
33. *Dendrophis gorei*.
34. *Pseudoxenodon macrops*.
35. *Tropidonotus platyceps*.
36. *Tropidonotus khasiensis*.
37. *Tropidonotus piscator*.
38. *Dipsadomorphus gokool*.
39. *Psammodynastes pulverulentus*.
40. *Dryophis prasinus*.
41. *Callophis maclellandii*.
42. *Amblycephalus monticola*.
43. *Trimeresurus monticola*.
44. *Trimeresurus gramineus*.

## EMYDOSAURIA.

1. *Gavialis gangeticus* (Gmel.).

Boulenger, *Fauna*, p. 3.

Although no specimens of the Gharial were obtained, Mr. Kemp tells me that it is not uncommon at Kobo together with the Gangetic Porpoise (*Platanista gangetica*). Apparently the short-nosed Crocodile (*Crocodilus palustris*) does not make its way so far up the Brahmaputra, although it occurs between Mangaldai in the Darrang district and Gauhati.

## CHELONIA.

2. *Kachuga tectum* (Gray).

Boulenger, *Fauna*, p. 43; *Cat. Chelonia Brit. Mus.*, p. 58;  
Siebenrock, *Zool. Jahrb. Jena*, 1909, suppl. x, p. 454.

A shell and skull of the genus *Kachuga* were obtained from the Dihang R. below Pasighat and must be referred to this species. The shell, however, which measures 21.7 cm. in length, is narrower than is usually the case, and Mr. Kemp tells me that the soft parts were deep olive in life without reddish marks of any kind. Possibly the specimen represents a local race, but I have examined apparently typical individuals of *K. tectum* from N. E. Assam.

The limits of the range of *K. tectum* are very imperfectly known. It has been recorded from several localities in central and western India and certainly occurs in many different parts of the river-systems of the Indus, Ganges and Brahmaputra. All specimens, however, that I have examined from central India, although several were labelled *K. tectum*, actually represented *K. intermedia*, a very closely allied and somewhat variable form that is common all over the Mahanaddi river-system and also in the lower reaches of the Godavari. I have recently seen large numbers of this form from Cuttack and Sambalpur in Orissa and find that the proportions and outlines of the neural plates are so variable that little reliance can be placed on them in separating the "species" from *K. tectum*. The skulls of the two forms are identical. The only constant feature of difference is therefore colouration, and I am inclined to think that the late Dr. Blanford<sup>1</sup> was right in regarding *K. intermedia* as being only a "variety" (or, as I would prefer to call it, a subspecies) of *K. tectum*. The true *K. tectum* also occurs, according to Siebenrock, in Cochin China, *Pangshura cochinchinensis*, Tirant,<sup>2</sup> being synonymous.

Mr. Kemp tells me that he could hear of only one land-tortoise having been seen during the Expedition and that it was not secured. Terrestrial Chelonia hibernate in northern India, but no species has as yet been recorded from the Himalayas.

<sup>1</sup> *J.A.S.B.*, (2) xxxix (1870), p. 339, and xlvi (1879), p. 110.

<sup>2</sup> *Etudes Div. Miss. Pavie*, iii, p. 494 (1904).

## LACERTILIA.

## Fam. GECKONIDAE.

3. *Gymnodactylus khasiensis* (Jerdon).

Boulenger, *Fauna*, p. 68.

Originally described from the Khasi Hills, this lizard appears to have a fairly wide range in the mountains of Assam and northern Burma.

Two specimens were taken by Mr. Kemp at Kobo in December under the bark of a tree, together with a young *Ptyctolaemus gularis*. Others were obtained by the 32nd Sikh Pioneers at an altitude of about 2,000 feet at Upper Rotung.

My own *G. himalayicus*<sup>1</sup> is a very closely related species, differing in its slighter build, more obscure colouration and less compressed digits and also in having a well-defined triangular patch of enlarged scales just behind the praeanal pores. This last point, however, is not a very good character as in some specimens of *G. khasiensis*, of which I have examined a large series, there is a single enlarged scale, or even a pair of such scales, in the same position, although in others the scales are uniformly small.

4. *Hemidactylus frenatus*, D & B.

A very common lizard at low altitudes in the E. Himalayas, Assam, Burma and the Malay Peninsula; often found in houses.

A specimen was taken on a lamp-post in the streets of Dibrugarh in November.

5. *Hemidactylus bowringii* (Gray).

Not uncommon at low altitudes in the E. Himalayas and in Assam and Burma; this species is occasionally found in houses. It is, however, more often taken in the jungle.

There is a specimen in the collection from Sadiya.

6. *Hemidactylus brookii*, Gray.

*Hemidactylus gleadowii*, Boulenger, *Fauna*, p. 86, fig. 27.

*Hemidactylus brookii*, *id.*, *Ann. Mag. Nat. Hist.*, (7) i, p. 123 (1898), and Annandale, *Rec. Ind. Mus.*, vii, p. 45 (1912).

This species, which is one of the commonest house-lizards all over the plains of India (in northern Madras certainly the commonest), has a very wide distribution in the tropics but apparently avoids mountainous regions. The highest altitude from which I have seen a specimen is 4,500 ft., and this was on the isolated mountain Parésnath in Chota Nagpur, now in the new Province of Bihar and Orissa. Several specimens were obtained at Sadiya.

<sup>1</sup> *J.A.S.B.*, 1906, p. 287, and *Rec. Ind. Mus.*, I, p. 152, pl. vi, figs. 1, 1a, 1b, 1c, 1d (1907).

*H. brookii* is by no means always domestic in its habits, but individuals found living wild among rocks or in jungle are as a rule darker in colour and somewhat stouter in form than those which inhabit human dwellings. In either case the species is mainly nocturnal.

*H. subtriedroides*<sup>1</sup> from Upper Burma only differs from *H. brookii*, of which it should probably be regarded as a variety, in its rather stouter habit and much larger dorsal tubercles. The tubercles are extremely variable in size even within the strict limits of *H. brookii*, and less frequently vary also in number. There is in the Indian Museum a specimen from Bangalore on which there are only two dorso-lateral rows of tubercles on each side, the middle region of the back being perfectly smooth. This individual was taken by myself, together with a normal one, on the post of a railing.

#### 7. *Hemidactylus platyurus* (Schneid.).

This gecko is common in the E. Himalayas, in which it is found as a rule at rather higher altitudes than the two preceding species. It is widely distributed in the Indo-Malayan and Malayan countries. So far as I am aware the western limit of its range is situated in Nepal, my own *H. nepalensis*<sup>2</sup> being undoubtedly synonymous. In the Darjiling district *H. platyurus* is often found in houses, but it is naturally an inhabitant of tree-trunks.

An unusually dark specimen was taken by Mr. Kemp at Pasighat under the bark of a tree.

#### Fam. AGAMIDAE.

#### 8. *Draco maculatus* (Gray).

Boulenger, *Fauna*, p. 112.

This species is widely distributed in Assam, Burma, the Malay Peninsula and Yunnan, the western limit of its range being situated near the point in Assam north of the Brahmaputra at which that river bends southwards. There are three specimens in Mr. Kemp's collection:—

- 16881 Janakmukh (alt. 600 ft.) Capt. C. E. Edward-Collins.
- 16882 Yembung (alt. 1,100 ft.):
  - " found in a hut in camp." .. S. W. Kemp.
- 16997 Pasighat (alt. 500 ft.) .. W. Cave-Brown.

Mr. Kemp describes the colouration of No. 16882, an immature male, as follows:—"Colour of back mottled warm brown, dark brown and black. Neck above with two elliptical black markings and a pair of black spots. 'Wings' above orange-brown Belly

<sup>1</sup> Annandale, *Ann. Mag. Nat. Hist.*, (7) xv, p. 29 (1905), and *J.A.S.B.*, 1905, pl. ii, fig. 1.

<sup>2</sup> *Rec. Ind. Mus.*, i, p. 151, pl. vi, figs. 2, 2a, 2b, 2c (1907).

dull greenish yellow; bright yellow beneath and on either side of pouch. 'Wings' beneath dull yellowish green, the orange colouring having a tendency to show through. Lateral neck-flaps orange beneath. Predominant head-colour very dark brown.'

The only other species of *Draco* as yet found in Assam is *D. norvillii*, Alcock,<sup>1</sup> a single specimen of which, now in the Indian Museum, was taken at Dum-Duma in N.-E. Assam some years ago. This species is closely related to *D. blanfordii*, Boulenger, from which it differs in having the tympanum completely covered with small scales. From *D. maculatus* it is easily distinguished by its longer snout and by the broad patches of enlarged scales scattered on each side of the back along the base of the alar membrane.

#### 9. *Ptyctolaemus gularis*, Boulgr.

Boulenger, *Fauna*, p. 117; Annandale, *J.A.S.B.*, 1905, p. 85;  
Wall, *Journ. Bomb. Nat. Hist. Soc.*, xviii, p. 505.

This is a very rare lizard in collections. I have only seen three specimens hitherto, two of them from Assam N. of the Brahmaputra. Major F. Wall, however, states that the species is common at Shillong in the Khasi Hills (4,900 ft.) and our third specimen is from that locality. The western limit of its range is apparently the same as that of *Draco maculatus*. It is possible that both will be found in the Buxa duars; we have both in the Indian Museum from Goalpara (Dhubri). *Ptyctolaemus* is certainly not indigenous in Calcutta.

Mr. Kemp found a very young specimen at Kobo in November; although probably not long hatched (or born), it bore the characteristic grooves on the side of the neck. Adults were taken at Kobo by Capt. de Courcy and at Rotung by Mr. Kemp, who did not obtain the species at altitudes of over 1,300 ft.

#### 10. *Acanthosaura minor* (Gray).

Boulenger, *Fauna*, p. 127.

This species is known from both Sikkim and the Khasi Hills. It is, however, rare in the Darjiling district. A small specimen was obtained at Upper Rotung (alt. ca. 2,000 ft.) in January.

#### 11. *Calotes versicolor* (Daud.).

Boulenger, *Fauna*, p. 135, fig. 42; Annandale, *Rec. Ind. Mus.*, vii, p. 46.

The only specimen in the collection is a very young one obtained at Sadiya.

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<sup>1</sup> *J.A.S.B.*, (2) lxiv, p. 14, pl. iii (1895)

12. *Calotes jerdonii*, Gunth.

Boulenger, *Fauna*, p. 137.

Common in the Khasi Hills; Col. Godwin-Austen obtained specimens in the Dafla Hills to the west of the Abor country, in which Mr. Kemp collected it at Komsing, Yembung and Balek. Both his specimens and Col. Godwin-Austen's are quite typical.

## Fam. ANGUIDAE.

13. *Ophisaurus gracilis* (Gray).

Boulenger, *Fauna*, p. 159, fig. 47.

A common species in the E. Himalayas at altitudes of between 4,000 and 5,000 ft.; it also occurs in the Khasi Hills, in Upper Burma and Yunnan and probably in the hills of Pegu.

A number of individuals of different ages were taken in the neighbourhood of Upper Rotung and Upper Renging (2,000—2,150 ft.) by the 32nd Pioneers while road-making. The large specimens have the back of a bright brick-red with very conspicuous blue cross-bars; on the tail the red fades to dull brown. The young are white with two blue-black stripes down each side and a somewhat indistinct and broken mid-dorsal stripe of the same colour; the latter is crossed at intervals by transverse rows of very small black spots, and there are rather larger black spots scattered on the lips and snout.

## Fam. VARANIDAE.

14. *Varanus bengalensis* (Daud.).

All over India and Ceylon except at high altitudes; also in Upper Burma.

A skin was obtained at Kobo by Col. (now Brigadier-General) D. C. F. Macintyre and presented by him to the Indian Museum.

## Fam. LACERTIDAE.

15. *Tachydromus sexlineatus*, Daud.

Boulenger, *Fauna*, p. 169; *Fasciculi Malayenses*, i, p. 158; Annandale, *J.A.S.B.*, 1905, p. 140.

This lizard is widely distributed in the damper parts of the Oriental Region. It is not found in Peninsular India.

A specimen was taken at Janakmukh (alt. 600 ft.) under the bark of a tree in December. It was probably hibernating, as the species is usually found among long grass.

## Fam. SCINCIDAE.

16. *Mabuia macularia* (Blyth).

A very common skink all over the plains of India, Burma and Ceylon. Two specimens were taken at Sadiya in November, "under chips of wood."

17. *Lygosoma indicum* (Gray).

*Lygosoma indicum* and *L. zebratum*, Boulenger, *Fauna*, p. 195.  
*Lygosoma indicum*, id., *Ann. Mus. Genova* (2nd ser.), xiii, p. 319.

A very common species in the foot-hills of the E. Himalayas and also in hilly country in Assam and Burma.

Specimens were taken under stones in the neighbourhood of Rotung and Upper Rotung (1,300 to 2,000 ft.) in December, January and March.

18. *Lygosoma courcyanum*, sp. nov.

(Plate v, fig. 5.)

Subgenus *Hinulia*. Allied to *L. (Hinulia) cacharensis*<sup>1</sup> from Assam but much more slender and with shorter limbs.

*Habit* slender, lacertiform; the distance between the axilla and the groin nearly twice that between the tip of the snout and the fore limb. Tail nearly twice as long as head and body. Total length 100 mm.

*Head* small, narrow, triangular; snout pointed; loreal region vertical; lower eye-lid scaly; ear-opening subcircular, much smaller than eye, without lobules; nostril pierced in a single nasal. Rostral much broader than deep, forming an extensive suture with fronto nasal; fronto-nasal undivided, much longer than praefrontals; no supranasals; praefrontals separate, short; frontal shorter than its distance from tip of snout, a little shorter than the parietals; its greatest breadth to its length as 7 to 9; parietals not meeting behind interparietal, forming a lengthy suture; interparietal small; a single pair of enlarged nuchals; 4 large, subequal supraoculars; 7 upper labials, 4th, 5th and 6th under eye.

*Scales* of body smooth, imbricate, in 24 rows; the ventrals slightly larger than the dorsals; two large praeanals.

*Limbs* short but well-formed, separated by a considerable distance where adpressed. Toes not compressed, of moderate length; 11 smooth lamellae under 4th toe.

*Colouration*.—Dorsal surface olive-brown minutely speckled with black; tail rather darker than back; a narrow pale band extending on each side from above the eye to the base of the tail; a rather broader black band running immediately below it; sides yellowish speckled with black; lateral surface of tail suffused with slate grey; ventral surface yellowish, speckled with slate-grey on tail.

<sup>1</sup> Annandale, *J.A.S.B.*, 1905, p. 145.

*Dimensions of type:—*

Total length .. ..	100 mm.
Length of head and body .. ..	35 ,,
Length of head .. ..	8 ,,
Breadth of head .. ..	4 ,,
Fore limb .. ..	9 ,,
Hind limb .. ..	13 ,,

*Type*.—No. 16900 in the Indian Museum register of Reptiles and Batrachia.

*Habitat*.—Two specimens were taken by Capt. the Hon. M. de Courcy, one at Rotung (1,300 ft.), the other at Upper Rotung (*ca.* 2,000 ft.).

## OPHIDIA.

Mr. Kemp asks me to state that a very large proportion of the snakes in his collection were captured by the officers and men of the 32nd Sikh Pioneers at the instance of Capt. the Hon. M. de Courcy. They were found while road-making, chiefly in December and January, and were probably hibernating at the time. Other snakes were presented by Capt. J. S. O'Niell, Capt. F. H. Stewart and Capt. R. S. Kennedy of the Indian Medical Service.

## Fam. TYPHLOPIDAE.

19. *Typhlops diardi*, Schleg.

Boulenger, *Fauna*, p. 238, fig. 70.

A considerable number of specimens of this common Himalayo-Burmese species were taken at Kobo, Pasighat, Janakmukh and Balek, several of them having been found crawling about on the surface in camp after rain.

*T. diardi* occurs all over Assam and Burma and is also found in the Himalayas, Siam and other adjacent countries.

20. *Typhlops tephrosoma*, Wall.

Wall, *Journ. Bombay Nat. Hist. Soc.*, xviii, p. 314.

A small specimen taken by the 32nd Sikh Pioneers at Janakmukh agrees well with Major Wall's description of the type from the Khasi Hills.

21. *Typhlops diversiceps*, sp. nov.

(Plate v, fig. 1.)

This species belongs to the same group as *T. braminus* and *T. beddomii*, but the anterior nasal is not in contact with the preocular and the posterior nasals do not meet behind the rostral.

Snout rounded, projecting. Nostril lateral, nasal completely divided; rostral barely reaching the level of the eyes, not half as wide as snout; upper head-scales about twice as large as body-

scales, transverse; anterior nasal widely separated from praecocular, in contact with first labial below; posterior nasal much larger, in contact with second labial, not meeting its fellow on the top of the head; eyes moderately distinct; praecocular larger than ocular, in contact with second and third labials; ocular in contact with third and fourth labials; 4 upper labials. Diameter of body 40 times in total length; tail longer than broad, ending in a minute spine; 18 scales round body.

*Colour* dark olive-brown, slightly paler on ventral surface. Dorsal surface of head chestnut, ventral surface pale yellow; the latter shade extending upwards on either side to the level of the eyes in the form of a narrow triangle, very clearly defined posteriorly on the throat.

*Length* 160 mm.: length of tail 3 mm.

*Type*.—No. 16864, Ind. Mus.

*Locality*.—Pasighat (500 ft.) 25-iii-12. (Capt. R. S. Kennedy, I.M.S.)

Fam. COLUBRIDAE.

Subfamily COLUBRINAE.

22. *Trachischium monticola* (Cantor).

Boulenger, *Fauna*, p. 286.

A common snake in the hills of Assam, less abundant in the E. Himalayas. Ten specimens were taken by the 32nd Sikh Pioneers while road-making in the neighbourhood of Upper Rotung (alt. ca. 2,000 ft.) in January. Capt. de Courcy took another in the Sirpo valley near Renging.

23. *Blythia reticulata* (Blyth).

Boulenger, *op. cit.*, p. 287, fig. 92.

Three specimens were taken at Upper Renging, at Upper Rotung and in the Sirpo valley near Renging. The species, which is the only one in the genus, is characteristically Assamese. Fresh adult specimens are almost black in colour with a beautiful deep-blue iridescence, the pale markings becoming inconspicuous with age.

*Aproaspidops*, gen. nov.

This new genus is allied to *Trirhinopholis* and *Plagiopholis*, Boulenger, both of which are only known from Burma. It thus belongs to a peculiar little group of monotypic genera that includes *Blythia* and the two just mentioned and inhabits hilly country in Burma and Assam. *Aproaspidops* can be recognized easily by the fact that there is an azygous shield between the rostral and the supranasals and also a small postnasal on each side. There is no praecocular and no loreal, unless the latter name should be applied to the small scale I have called the postnasal.

Maxillary moderate, with about 20 teeth, which decrease slightly in size from before backwards; mandibular teeth similar to maxillary. Head not distinct from neck; eye small, with round pupil; nostril pierced between two nasals, the posterior of which is followed by a small scale (postnasal) in contact with the supranasal, praefrontal and first upper labial. Praefrontal entering the eye and in contact with upper labials; no praocular; rostral separated from supranasals by a triangular azygous shield. Scales smooth, without apical pits, imbricate, in 12 straight rows; ventrals rounded. Tail short; subcaudals in two rows.

**24. Aproaspidops antecursorum, sp. nov.**

(Plate v, fig. 2.)

Snout moderate, rounded. Rostral much wider than deep, just visible from above, much deeper than the shield which separates it from the supranasals; the latter completely divided, about half as long as the praefrontals, which are also completely divided; frontal about  $1\frac{1}{2}$  times as long as broad, about as long as its distance from the snout, much shorter than the parietals. Nostril between two small, deeply concave scales, separated from the first labial; postnasal triangular, smaller than the two nasals of one side together. Praefrontal in contact with second and third upper labials, the latter and the fourth entering the eye; no subocular; a single large postocular; supraocular much longer than deep; 6 upper and 6 lower labials; loreals 1+2. Two pairs of chin-shields, posterior pair very short, in contact with the fourth pair of labials; the first pair in contact with three pairs of labials, first pair of labials forming a long suture behind the mental. Ventrals 136; subcaudals 16; anal divided; tail ending in a sharp spine.

*Colour* dark olive, each body-scale with a slightly darker border; ventrals and subcaudals with pale borders; an incomplete white collar extending over the greater part of the neck on each side some distance behind the gape.

*Length* 162 mm.: length of tail 12 mm.

*Type*.—No. 16844, Ind. Mus.

*Locality*.—Janakmukh, 600 ft.: 13-xii-11.

The single small, perhaps immature, specimen was taken by the 32nd Sikh Pioneers while road-making. It closely resembles young *Blythia reticulata* in appearance but can easily be distinguished by its circular pupil and by the extra scales behind the rostral and the nasals.

**25. Polydontophis collaris (Gray).**

Boulenger, *op. cit.*, p. 302.

A common snake all over the Himalayas up to 10,000 feet, in Assam, Upper Burma, etc. Specimens were taken in the Sirpo valley near Renging and at Kobo by Capt. de Courcy. They represent the typical form.

26. *Ablabes porphyraceus* (Cantor).

Boulenger, *op. cit.*, p. 308.

A common Malayo-Himalayan snake probably not found at great altitudes. Specimens were taken at Balek and between Kalek and Misshing by Capt. Wilson and Mr. Kemp respectively.

27. *Ablabes pavo*, sp. nov.

(Plate v, fig. 3.)

A magnificent species easily recognized by the large black and yellow ocelli on its back, but also to be distinguished by numerous scale-characters, notably by the large number of ventrals.

Rostral much wider than deep, visible from above; supranasals distinct, about half as long as praefrontals, which are also distinct; frontal  $1\frac{1}{3}$  times as long as broad, a little shorter than its distance from the tip of the snout, almost as long as the parietals; nasal completely divided, extending backwards as far as the suture between the second and third labial; no distinct loreal; a single praecocular; two postoculars, only the upper one in contact with the parietal; 7 upper labials, the third and fourth entering the eye; temporals  $2+2$ ; the shields on the sides of the head minutely pitted; two pairs of chin-shields, the anterior pair in contact with three pairs of labials, the posterior pair in contact with only one pair. Scales in 19 rows. Ventrals 233; subcaudals 80; anal and subcaudals divided.

*Colour*.—Sides and back pale bluish grey, each scale bearing an irregular patch of peach colour; back ornamented with a row of large black longitudinally oval rings, each with a yellow centre and separated one from another by only a short interspace; on the tail the yellow centres of the rings break up into small spots and finally at the tip, disappear altogether; about 50 rings in all; sides with irregular zig-zag black, yellow-edged vertical bars; ventral surface yellowish with numerous black cross-bars which are usually interrupted in the middle line; head black with a broad yellow bar across the snout, a second across the vertex behind the eyes and a third across the nape, the two latter being  $\Delta$ -shaped; lips, chin and throat yellow with large black spots.

*Length* 640 mm.: length of tail 108 mm.

*Type*.—No. 16797, Ind. Mus.

*Locality*.—Upper Rotung; taken by 32nd Sikh Pioneers while road-making, 13-xii-11.

28. *Ablabes frenatus* (Gunth.).

Boulenger, *Fauna*, p. 306.

A characteristic Assamese species. Three specimens were taken at Upper Rotung (2,000 ft.) in January. Two were found while road-making, while one was sitting coiled up in the middle of a path.

29. *Simotes albocinctus* (Cantor).

Boulenger, *Fauna*, p. 312.

Not uncommon in the hills of Assam and Burma. Wall<sup>1</sup> has described, under the name *juglandifer*, a peculiar variety distinguished mainly by colouration but now regarded by him as a distinct species. It is from the E. Himalayas and Assam. Specimens of the typical form were taken by Capt. de Courcy at Kobo and in the Sirpo valley near Renging.

30. *Oligodon erythrorhachis*, Wall.

Wall, *Journ. Bombay Nat. Hist. Soc.*, xix, p. 923, pl.

Two specimens from Upper Rotung (alt. ca. 2,000 ft.) taken in December by the 32nd Sikh Pioneers must be referred to this species. Both, however, differ in colouration from the type. The smaller specimen measures 300 mm. in length and is of a brick-red colour with numerous white, black-edged cross-bars on the body and tail. There are faint traces of a dark mid-dorsal line and the head and ventral surface are marked as in Major Wall's figures. The second specimen is larger, measuring 510 mm., and differs from the smaller one in being of a deep crimson colour and having the cross-bars on the body and tail relatively broader and slate-grey instead of white.

31. *Zamenis mucosus* (Linn.).

Boulenger, *Fauna*, p. 324.

A small specimen of the Common Rat-Snake was taken at Janakmukh by Capt. O'Neill.

32. *Coluber taeniurus* (Cope).

Boulenger, *Fauna*, p. 333; *Fascic. Malay.*, i, p. 162.

Two specimens were taken in January at Upper Rotung by the 32nd Sikh Pioneers while cutting a road. The species has a somewhat curious distribution, ranging from Darjiling into not only south-western but also northern China. In the Malay Peninsula it is usually found in caves feeding on bats. Cavernicolous individuals are always very pale in colour, but it is by no means certain that this is not due to the direct effect of lack of light on the organism.

33. *Dendrophis gorei*, Wall.

Wall, *Journ. Bombay Nat. Hist. Soc.*, xix, p. 829, pl., fig. 1—3 (1910).

I doubt whether this is more than a local race of *D. pictus* peculiar to the north-east corner of Assam and the neighbouring

<sup>1</sup> *Journ. Bombay Nat. Hist. Soc.*, xix, pp. 3, 8, and xx, p. 1162, fig.

foot-hills. There are three specimens in the Abor collection which agree well with Major Wall's specimen from Dibrugarh now in the collection of the Indian Museum. They are from Kobo (400 ft.), from between Janakmukh and Balek and from the Siyom valley below Damda (*ca.* 1,400 ft.).

**34. *Pseudoxenodon macrops* (Blyth).**

Boulenger, *Fauna*, p. 340.

A specimen was taken near Sidi stream (alt. *ca.* 2,000 ft.) by the 32nd Sikh Pioneers. The species is very common in the Darjiling district from the base of the foot-hills up to 5,000 ft., occurring also in the hills of Assam and Burma but apparently in smaller numbers.

**35. *Tropidonotus platiceps*, Blyth.**

Boulenger, *Fauna*, p. 344.

A very variable species common in the Himalayas up to 10,000 ft.; also occurs in the Khasi Hills and the mountains of Burma. A specimen was taken at Upper Rotung.

**36. *Tropidonotus khasiensis*, Boulgr.**

Boulenger, *Fauna*, p. 344, and *Ann. Mus. Genova* (2nd ser.), xiii, p. 322.

A scarce species hitherto only found in the Khasi and Karin Hills. One was taken at Rotung by Capt. de Courcy.

**37. *Tropidonotus piscator* (Schneid.).**

Boulenger, *Fauna*, p. 349.

Young specimens of this very common and widely distributed species were taken at Rotung and Upper Rotung (1,300 and *ca.* 2,000 ft.). It occurs in the W. Himalayas up to at least 4,500 ft.

Subfamily DIPSADOMORPHINAE.

**38. *Dipsadomorphus gokool* (Gray).**

*Dipsas gokool*, Boulenger, *Fauna*, p. 360.

*Dipsadomorphus gokool*, *id.*, *Cat. Snakes Brit. Mus.*, iii, p. 64 (1895).

A specimen was taken at Dibrugarh. It is not improbable that this snake is actually restricted to Assam, for Cantor's localities are notoriously inaccurate and the record of this species from Penang apparently rests on a specimen from his collection in the British Museum. Bengal and Assam were not clearly distinguished by many of the older naturalists who wrote on Indian reptiles.

39. *Psammodynastes pulverulentus* (Boie).

Boulenger, *Fauna*, p. 363, and *Cat. Snakes Brit. Mus.*, iii, p. 173.

Specimens, 8 in all, were taken at the following places during the Expedition:—Kobo, Balek, Rotung, the Sirpo valley near Renging and Renging. The species is widely distributed in the damper parts of the Oriental Region but does not occur in Peninsular India. Mr. Kemp's series exhibits a remarkable range of colour-variation, no two individuals being precisely alike in colouration.

40. *Dryophis prasinus*, Boie.

Boulenger, *Fauna*, p. 369.

A widely distributed species in the E. Himalayas, Assam, Burma, Indo-China and Malaysia. Specimens were taken at Janakmukh by Capt. O'Neill and Capt. de Courcy, at Rotung by Capt. F. H. Stewart and at Balek by Capt. Wilson. All belong to the typical leaf-green form.

## Subfamily ELAPINAE.

41. *Callophis maclellandii* (Reinh.).

Boulenger, *Fauna*, p. 385, and *Cat. Snakes Brit. Mus.*, iii, p. 398.

A very common snake in the hills of Assam, occurring also in the E. Himalayas, Burma, S. China, etc. Two specimens of the typical form were taken at Upper Rotung (2,000 ft.) by the 32nd Sikh Pioneers.

## Fam. AMBLYCEPHALIDAE.

42. *Ambycephalus monticola* (Cantor).

Boulenger, *Fauna*, p. 415.

This snake, which occurs in the E. Himalayas, the hills of Assam and the Nicobar Is., is evidently very common in the Abor foot-hills. The 32nd Sikh Pioneers took 12 specimens of different sizes while road-making in the neighbourhood of Upper Rotung in January. They also caught specimens at Rotung and in the Sirpo valley.

## Fam. VIPERIDAE.

43. *Lachesis monticola* (Gunth.).

*Trimeresurus monticola*, Boulenger, *Fauna*, p. 426.

*Lachesis monticola*, id., *Cat. Snakes Brit. Mus.*, iii, p. 548.

Widely distributed in the E. Himalayas, the mountains of Assam, Burma and Yunnan and in hilly districts of the Malay Peninsula. Two specimens were obtained, one at Rotung, the other at Upper Rotung. Mr. Kemp tells me that he heard it stated

on several occasions that Russel's Viper (*Vipera russeli*) occurs in the Abor country but that these statements probably referred to *Trimeresurus monticola*.

#### 44. *Lachesis gramineus* (Shaw).

*Trimeresurus gramineus*, Boulenger, *Fauna*, p. 429.

*Lachesis gramineus*, *id.*, *Cat. Snakes Brit. Mus.*, iii, p. 554.

A small specimen of the typical green form was taken at Kobo by Capt. Mitchell. The species is common in the hills of Assam, Burma, Malaysia, etc. and also occurs in the Himalayas.

#### PART II.—GEOGRAPHICAL.

The following species are only represented in Mr. Kemp's collection by specimens obtained at Dibrugarh or Sadiya or observed or caught in the Dihong R.:—*Gavialis gangeticus*, *Kachuga tectum*, *Hemidactylus frenatus*, *H. bowringii*, *H. brookii*, *Calotes versicolor*, *Mabuya macularia* and *Dipsadomorphus gokool*. These 8 species cannot, therefore, be regarded as having been proved to be inhabitants of the Abor foot-hills. The Indian Museum is, however, fortunate in possessing the collection of reptiles made in the Dafla foot-hills, which are situated a short distance to the west of the Abor country, by Col. Godwin-Austen many years ago, and it will add interest to geographical speculations about the fauna of the latter country if we combine the list of Mr. Kemp's collection with one of that obtained by Col. Godwin-Austen.

#### GEOGRAPHICAL LIST OF THE REPTILES KNOWN FROM THE HIMALAYAN FOOT-HILLS E. OF BHUTAN.

Name.	Assam.	Sikhim.	Burma.	REMARKS.
<i>Nicoria tricarinata</i> ..	x	..	..	Taken by Col. Godwin-Austen in the Dafla Hills; also known from Assam north of the Brahmaputra and from Chota Nagpur in Peninsular India.
<i>Gymnodactylus khasiensis</i> ..	x	..	x	Khasi Hills and Upper Burma.
<i>Hemidactylus frenatus</i> ..	x	x	x	Common in the Malay Peninsula; taken in the Dafla Hills; very widely distributed.

Name.	Assam.	Sikhim.	Burma.	REMARKS.
<i>Hemidactylus platyurus.</i>	x	x	x	The Himalayas from the Nepal Valley eastwards; also Ceylon, Malayasia, etc.
<i>Draco maculatus</i> ..	x	..	x	Malaya Peninsula, W. China, etc.
<i>Ptyctolaemus gularis</i> ..	x	..	..	Assam N. of Brahmaputra and Khasi Hills.
<i>Acanthosaura minor</i> ..	x	x	..	E. Himalayas and Khasi Hills.
<i>Calotes jerdonii</i> ..	x	..	..	Khasi Hills; both Dafla and Abor Hills.
<i>Japalura andersoniana*</i> <sup>1</sup> ..	..	..	..	Only known from the Dafla Hills.
<i>Salea austeniana*</i> <sup>2</sup> ..	..	..	..	Do. do.
<i>Ophisaurus gracilis</i> ..	x	x	x	Perhaps only in Upper Burma.
<i>Varanus bengalensis</i> ..	x	..	x	I cannot find any record of the occurrence of this common Indian species in Sikhim, but it probably does occur there.
<i>Tachydromus sexlineatus</i>	x	x	x	I have not seen this species in the Himalayas, but it is said to occur in Sikhim: it is also found in S. China, the Malay Peninsula, etc.
<i>Lygosoma indicum</i> ..	x	x	x	A common species in Burma, not known from the Malay Peninsula.
„ <i>courcyanum,*</i> sp. nov. ..	..	..	..	Only known from the Abor Hills.
„ <i>albopunctatum</i>	x	..	x	Also from Peninsular India, Malay Peninsula, etc.
<i>Typhlops braminus</i> ..	x	x	x	Very widely distributed; known from the Dafla Hills.

<sup>1</sup> Annandale, J.A.S.B., 1905, p. 85.<sup>2</sup> Id., Rec. Ind. Mus., II, p. 37 (1908).

Name.	Assam.	Sikhim.	Burma.	REMARKS.
<i>Typhlops tephrosoma</i> ..	x	..	..	Only known from the Khasi Hills.
„ <i>diardi</i> ..	x	x	x	Also in Indo-China, Siam, etc.
„ <i>diversiceps</i> , * sp. nov. ..	..	..	..	Only known from the Abor Hills.
<i>Trachischium monticola</i>	x	x	..	Common in the E. Himalayas and the hills of Assam.
<i>Aproaspidops antecursorum</i> , * gen. nov. ..	..	..	..	Genus only known from the Abor Hills.
<i>Blythia reticulata</i> ..	x	..	..	Common in the hills of Assam.
<i>Polyodontophis collaris</i> ..	x	x	x	Also in W. Himalayas and S. W. China.
<i>Ablabes porphyraceus</i> ..	x	x	x	Also in Yunnan, Malay Peninsula, Sumatra, etc.
<i>Ablabes pavo</i> , sp. nov. ..	..	..	..	Only known from the Abor Hills.
<i>Ablabes frenatus</i> ..	x	..	..	Hills of Assam.
<i>Simotes albocinctus</i> ..	x	x	x	Common in Assam.
<i>Oligodon erythrorhachis</i>	x	..	..	Hitherto only known from hills S. of Brahmaputra.
<i>Zamenis mucosus</i> ..	x	x	x	A widely distributed Oriental species.
<i>Coluber taeniurus</i> ..	x	x	x	From the E. Himalayas to Yunnan; the Malay Peninsula; also Manchuria and Indo-China.
<i>Dendrophis gorei</i> ..	x	..	..	Only known from the N. E. corner of Assam.
<i>Pseudoxenodon macrops</i>	x	x	x	Hill species but not found at great altitudes.
<i>Tropidonotus platiceps</i>	x	x	x	Found up to 10,000 ft.
„ <i>khasiensis</i>	x	..	x	Found in Karin and Khasi Hills.
„ <i>piscator</i> ..	x	x	x	Widely distributed in Oriental Region.

Name.	Assam.	Sikhim.	Burma.	REMARKS.
<i>Psammodynastes pulverulentus</i> ..	x	x	x	Also in Indo-China, Siam, the Malay Peninsula and Archipelago, etc.
<i>Dryophis prasinus</i> ..	x	x	x	Do. do.
<i>Callophis maclellandii</i>	x	x	x	Also in Nepal, S. China, etc.
<i>Amblycephalus monticola</i> ..	x	x	..	Also in Nicobars.
<i>Trimeresurus monticola</i>	x	x	x	Also in Yunnan, Malay Peninsula, etc.
,, <i>gramineus</i>	x	x	x	Also in Siam, S. China, Indo-China, the Malay Peninsula and Archipelago.

The only tortoise in this list (*Nicoria<sup>1</sup> tricarinata*) is one of a small group of more or less terrestrial Chelonia that occur both in Chota Nagpur in Peninsular India and in the northern part of Assam but apparently not in any intermediate locality. It is, however, evident that we know as yet very little about the distribution of the Indian land-tortoises.

The genera of lizards and snakes that are known to occur in the foot-hills N. of the Brahmaputra and E. of Bhutan are for the most part widely distributed. Only one appears to be endemic, viz., the new genus *Aproaspidops*, which is allied to the Burmese genera *Trirhinopholis*<sup>2</sup> and *Plagiopholis*.<sup>3</sup> The genera *Blythia* and *Ptyctolaemus* are characteristically Assamese, while *Pseudoxenodon*, *Japalura* and *Draco* are restricted to the damper parts of the Oriental Region, the last-named being a characteristically Malayan genus also found in S. India, while the two first are essentially continental in distribution. The genus *Salea* only occurs in the foot-hills E. of Bhutan, in Lower Burma and in S. India, being thus almost analogous in its range to the Ranid genus *Micrixalus*.

If we separate out the 42 species in the list into geographical groups as was done in the case of the Batrachia (p. 34 *antea*) we find that the following percentages can be calculated:—

- |  |          |
|--|----------|
| I. Species of wide distribution in the Himalayas, Assam, Burma and Indo-China or Malaysia .. .. .. | 16 = 38% |
| II. Species of very wide general distribution  | 6 = 14%  |

<sup>1</sup> Stejneger (*Proc. Biol. Soc. Wash.*, xv, p. 238 (1902), and Siebenrock (*Zool. Jahrb. Jena*, 1909, suppl. x, p. 494, point out that by the strict letter of the law of priority the name of this genus should be *Gaeomyda*.

<sup>2</sup> Boulenger, *Cat. Snakes Brit. Mus.*, i, p. 419.

<sup>3</sup> *Id., ibid.*, p. 301.

III.	Apparently endemic species ..	6 = 14%
IV.	Species only known hitherto from Assam ..	7 = 16.5%
V.	Assamo-Burmese species ..	3 = 7%
VI.	Himalayo-Assamese species ..	3 = 7%
VII.	Species only known from Assam and Peninsular India ..	1 = 2.5%

There are no exclusively Himalayan species in the list and none that have hitherto been known only from Burma. If we compare this analysis with that of the Batrachian fauna of the Abor Hills published on p. 35 of this volume, the chief apparent difference is that the endemic forms appear to be fewer and the representatives of what I have called elsewhere the Malayo-Himalayan fauna much more numerous. This may be due in part to the fact that the lizards and snakes of Assam are much better known than the frogs and toads, and in part to the wider distribution of species in the former groups. In the main the results are strictly comparable in what may be regarded as their essential feature, *viz.*, in illustrating the non-Himalayan nature of the Abor fauna. Unfortunately we know almost nothing of the reptiles and Batrachia of Bhutan, but the little that we do know would suggest that the eastern boundary of the true Himalayan fauna is formed by the R. Tista, which flows down south through the Himalayas to the west of Bhutan. This river, at any rate in its present course, is apparently a much more ancient one than the existing Brahmaputra.

The reptiles of the extreme east of the Himalayas, although they have strong Assamese affinities, are by no means identical with those of the Khasi Hills. It is particularly noteworthy that the species of *Japalura* which occur in the Dafla Hills is not nearly so closely related to the common *J. variegata*<sup>1</sup> of Sikkim as that species is to *J. planidorsata* of the Khasi Hills, and none of the six apparently endemic species have, so far as we are aware, close allies in the other mountains of Assam.

We may say therefore that the reptiles of the Abor foot-hills agree with the Batrachia in differing considerably from those of the foot-hills immediately to the west of Bhutan and in including a well-marked endemic element, but that they appear to be more closely connected with the fauna characteristic of the damp jungles of the E. Himalayas, Assam, Burma, Indo-China and the Malay Peninsula. It is to this fauna that it is convenient to apply the term "Malayo-Himalayan." Probably the comparative dryness of the forests on the foot-hills west of Nepal has prevented many damp-loving animals of Malayan origin from penetrating further afield in a westerly or north-westerly direction, while a smaller contingent has been stayed by the course of the R. Tista.

<sup>1</sup> I was wrong in stating that this species occurs in Assam (J.A.S.B., 1905, p. 92), having been misled by badly preserved specimens of *J. planidorsata*.

## APPENDIX.

## DESCRIPTIONS OF THREE NEW INDIAN LIZARDS.

As a matter of convenience I take this opportunity to describe three lizards, one of which is of particular interest in connection with the Abor fauna in that it comes from the Bengal frontier of Bhutan. The other two are from the Bombay Presidency and Sylhet respectively.

*Hemidactylus platyceps*, sp. nov.

*Habit* slender; depressed; size small.

*Head* narrowly ovoid, strongly depressed and very shallow; snout bluntly pointed, about as long as distance between eye and ear; eye small; ear-opening minute, longitudinally oval. Rostral much more than twice as broad as deep, feebly cleft above; nostril between rostral, first labial and three small scales; 9 upper, 7 lower labials; snout covered with strongly keeled granules, rest of head with smaller and slightly irregular convex granules; two pairs of chin-shields, followed on each side by several irregular scales; first pair of chin-shields forming a long suture behind mental; throat-scales small, smooth, imbricate.

*Scales*.—Back covered with small convex granules of somewhat unequal size, with 12 longitudinal rows of much larger strongly keeled tubercles; these much larger than ear-opening; dorsal surface of limbs covered with unequal keeled granules; ventral scales rather large, smooth, imbricate; tail covered above and below with smooth imbricate scales which are a little larger on the ventral than on the dorsal surface.

*Limbs* short, the adpressed hind limb barely reaching the axilla. Fingers and toes short, free; 8 lamellae under 4th, 4 under inner toe. Distal joint of inner digit extremely short.

*Tail* short, somewhat depressed as a whole, triangular in vertical section.

*Colouration*.—Dorsal surface dull olivaceous, with a dark longitudinal line extending on either side from the tip of the snout above the eye to the base of the tail; this line followed below by a pale one and then by a second dark one; two very narrow dark lines separated by a pale interspace below the second broader one on the sides of the belly; tail dark olivaceous; ventral surface yellowish green, suffused with dark olivaceous on the tail.

Total length ..	..	70 mm.
Length of head and body ..	..	33 ,,
Length of tail ..	..	37 ,,
Length of head ..	..	10 ,,
Length of fore limb ..	..	10 ,,
Length of hind limb ..	..	8 ,,

*Habitat*.—Bilimora, Bombay Presidency (*T. Bainbrigge Fletcher*), 13-ii-11.

*Type*.—No. 17020, Ind. Mus. (♀).

We are indebted to Mr. T. Bainbrigge Fletcher for the unique specimen of this curious little lizard, which appears to be very distinct from any hitherto described. It belongs to the section of the genus typified by *H. frenatus*, D. & B., and is perhaps nearer the S. Indian *T. reticulatus*, Beddome, than any other species. It may be distinguished from that form by its flattened head, broad rostral and longitudinal dark stripes.

### *Japalura bengalensis*, sp. nov.

(Plate v, fig. 4.)

*Japalura yunnanensis*, Annandale (*nec Anderson*), *J.A.S.B.*, 1906, p. 288.

In the paper cited I referred to the specimen here described as the male of *Japalura yunnanensis*, Anderson, but having since had an opportunity of examining an example of that species and having partially dissected the one from Buxa, I find that the latter is a female and differs from the Chinese form. It may be described as follows:

*Habit* stout; body moderately compressed; size large.

*Head* triangular; its dorsal surface sloping downwards and forwards from behind the eyes, slightly concave between the orbits; scales of dorsal surface irregular, keeled, largest on snout; 9 upper and 9 lower labials; snout longer than diameter of eye, bluntly pointed. A small gular pouch, no transverse fold across the throat.

*Scales* of back and sides small, almost granular, mixed with much larger keeled scales which tend to be grouped in small patches; no dorso-lateral rows of enlarged scales; ventrals larger than largest dorsals, strongly keeled, imbricate, pointed behind; scales on upper surface of limbs irregular in size, leaf-shaped, strongly keeled.

*Crest*.—A well-developed nuchal crest (in the female) consisting of upright lanceolate scales shorter than half the diameter of the eye rising from a fold of skin covered with almost granular scales; no dorsal crest on the anterior half of back, a very slight one on the posterior half.

*Limbs* moderate. Adpressed hind limb reaches anterior border of orbit; tibia about as long as skull; third and fourth fingers equal.

*Colouration*.—Head dull olivaceous with two narrow brown cross-bars on the dorsal surface, one just in front of, the other just behind the eye; dark lines radiating from the eye; lips with dark vertical bars; sides of head irregularly marked with dark brown; back and sides (in spirit) livid bluish-grey with a fine reticulation of dark brown; tail obscurely barred; limbs marked irregularly; ventral surface yellowish; a black patch on the gular pouch.

Total length ..	..	310 mm.
Length of head and body ..	..	110 ,,
Length of tail ..	..	200 ,,
Length of head ..	..	33 ,,
Length of fore limb ..	..	55 ,,
Length of hind limb ..	..	85 ,,

*Locality*.—Buxa, Jalpaiguri district, Bengal frontier of Bhutan.

*Type*.—No. 12564, Ind. Mus. (♀).

It is probable that this species inhabits the foot-hills of Bhutan, perhaps replacing *J. variegata* east of the R. Tista and being replaced by *J. andersoniana* at some unknown point situated still further east.

*J. bengalensis* is one of the largest species in the genus and easily surpasses either the Sikhim, the Dafla or the Khasi form in this respect. It is distinguished from the first (*J. variegata*) not only by its larger size but also by the nature of its crest, its colouration and scale-characters. From *J. planidorsata* the shape of its body will readily distinguish it, while its hind limbs are much shorter than in *J. andersoniana*.

#### *Tropidophorus assamensis*, sp. nov.

This species is closely related to *Tropidophorus cochinensis*, D. & B., from which it differs in its more slender form, shorter limbs, keeled ventrals, etc.

*Habit* slender; cylindrical.

*Head*.—Snout sharply pointed, narrow, no longer than orbit. Dorsal scales strongly ridged; a single fronto-nasal, which is almost as broad posteriorly as it is long; praefrontals short, forming a median suture; frontal shorter than fronto-parietals and interparietal together; 4 supraoculars, the 1st and 4th longest; 5 supraciliaries, 1st longest; fronto-parietals longer than interparietal, forming a suture behind it; 5 upper labials, 4th longest; 3rd, 4th and 5th beneath eye; an azygous mental; tympanum smaller than eye-opening.

*Scales*, 30 round body, all strongly keeled and spinously produced; ventrals largest; throat scales not strongly keeled but ending in a sharp point posteriorly; a pair of large praeanals; dorsal and lateral tail-scales keeled; ventral tail-scales smooth.

*Limbs* short but well-formed. Hind limb reaches wrist. Infra-digital lamellae smooth.

*Tail* cylindrical, tapering, longer than head and body.

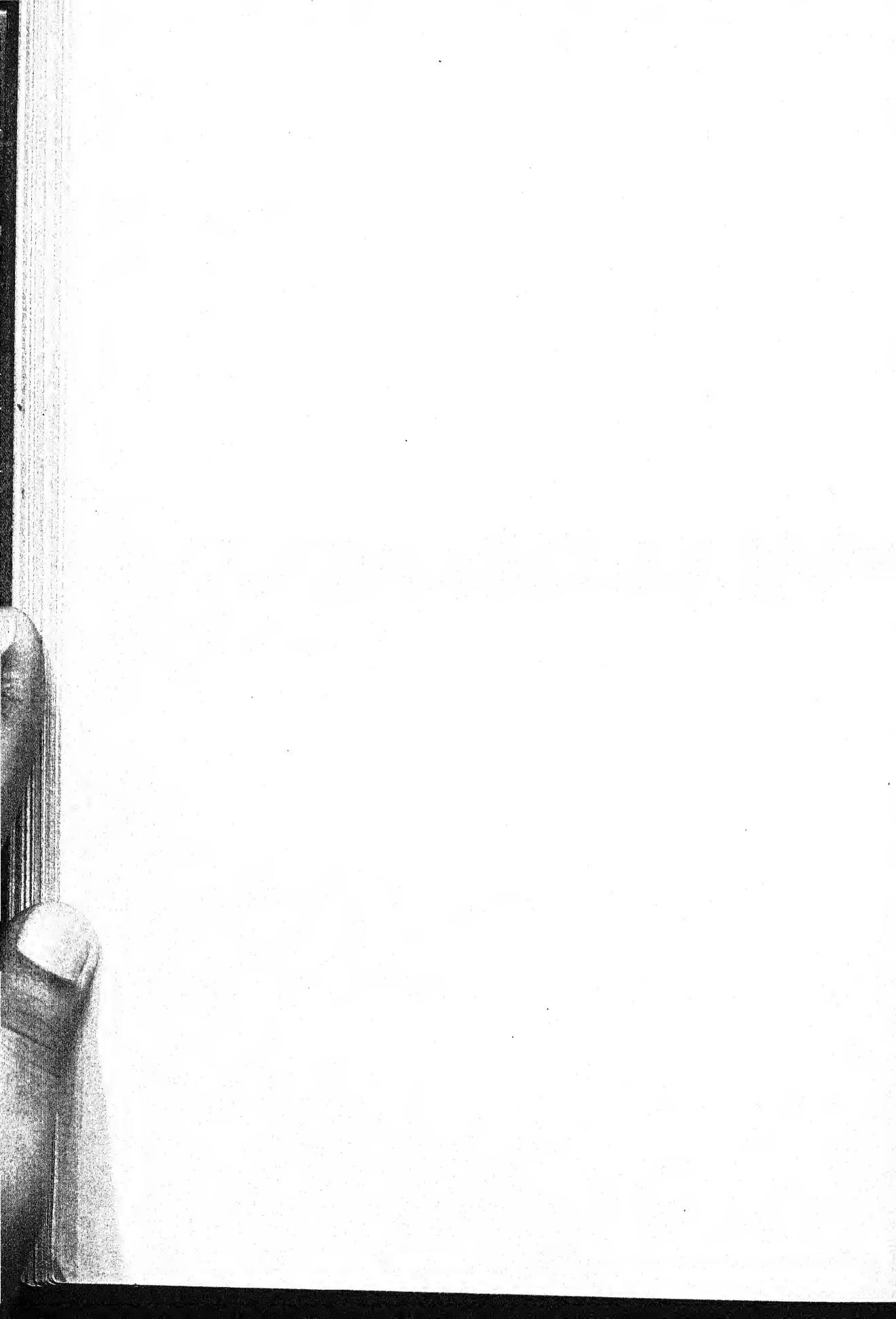
*Colouration*.—Dorsal surface dark brown obscurely marbled with yellow, three cross-bars of latter colour; one across hips, a second across shoulders and a third (less distinct than others) across back of neck; tail rather darker, obscurely banded; head brown; sides and lips black with small white spots; ventral surface yellowish; small black spots on chin, throat and chest; ventral surface of tail dark with an interrupted mid-ventral pale stripe, which becomes obscure distally, and numerous small yellowish spots.

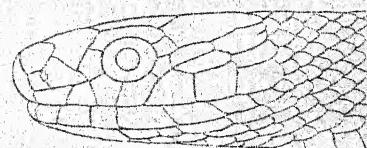
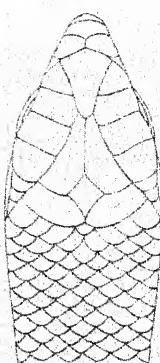
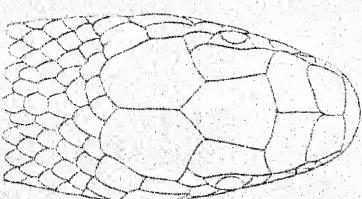
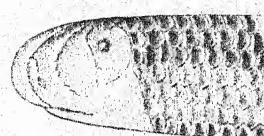
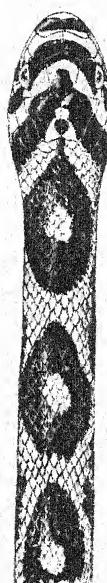
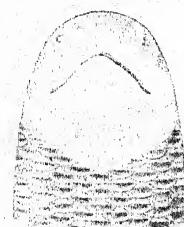
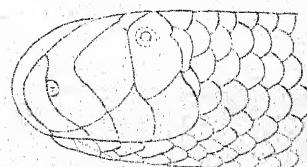
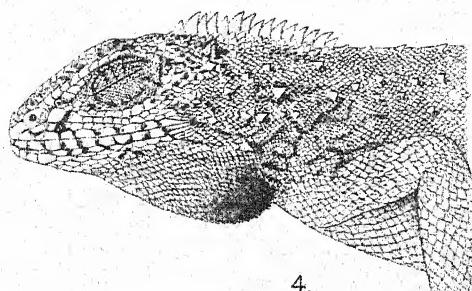
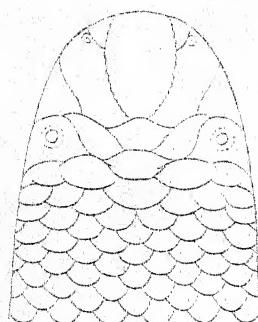
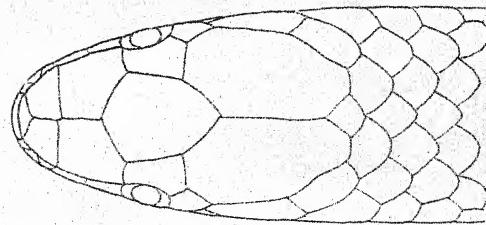
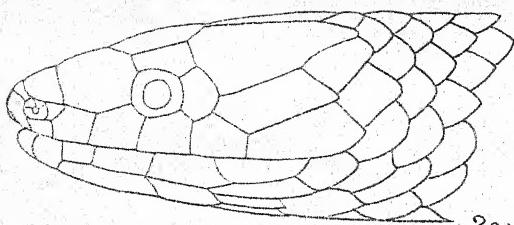
Total length ..	..	..	90 mm.
Length of tail	..	..	51 "
Length of head	..	..	9 "
Breadth of head	..	..	5 "
Length of fore limb	..	..	12 "
Length of hind limb	..	..	14 "

*Type*.—No. 17029, Ind. Mus.

*Locality*.—Haraigaj range, 550 ft., Sylhet hills, Assam.

A single specimen was obtained by Mr. G. Mackrell, who has kindly presented it to the Indian Museum. It differs widely from *T. berdmorei*, of which we possess the type. *T. yunnanensis*, Boulenger, is in my opinion synonymous with the latter species, of which I have examined many Burmese specimens. The scales seem to vary greatly in the degree to which they are keeled and in some cases are quite smooth, while the number of longitudinal rows of scales is not by any means constant.

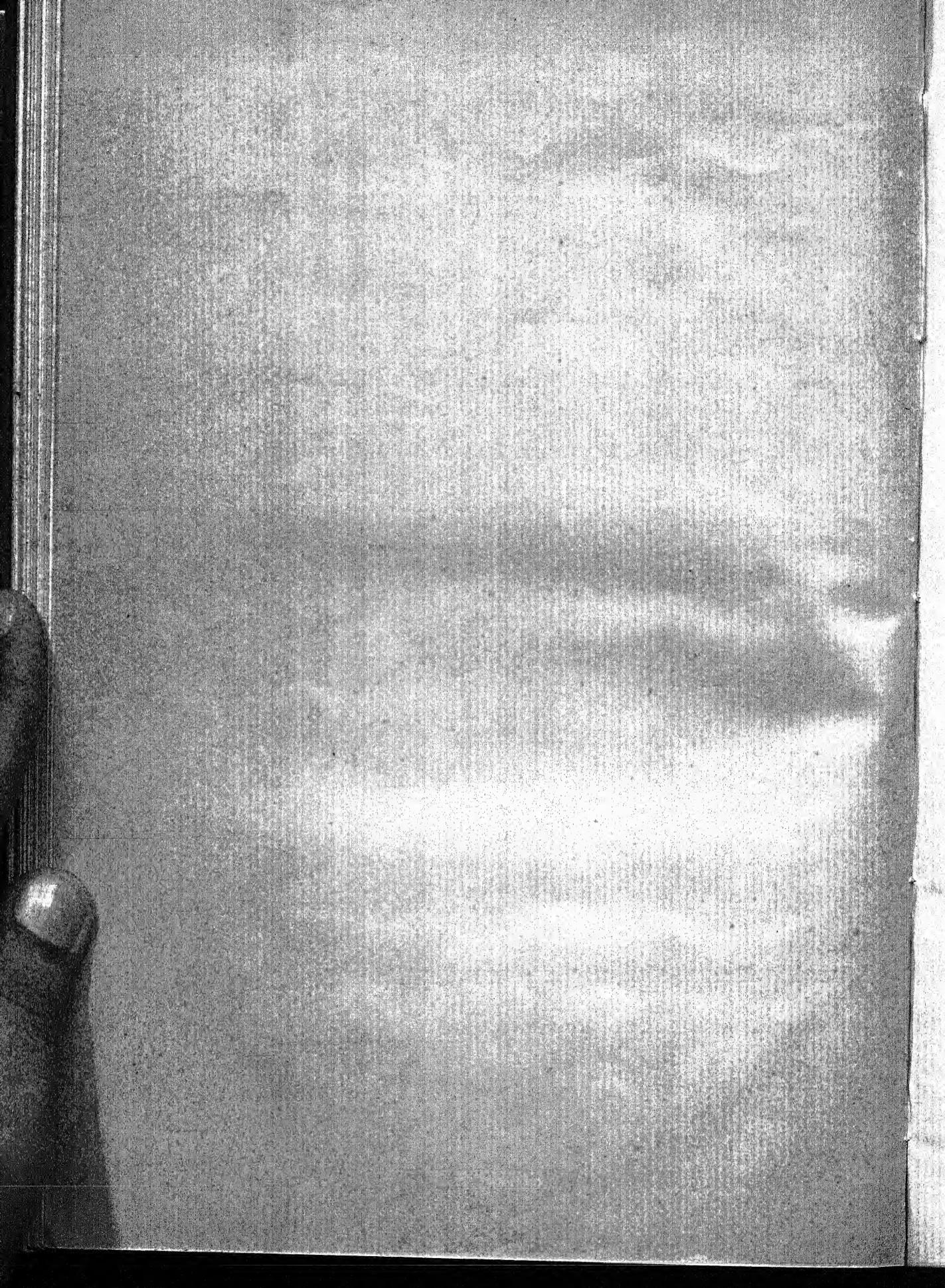




A.C. Chowdhary, del.

1. *Typhlops diversiceps*, sp. nov.
2. *Aproaspidops antecursorum*, gen. et sp. nov.
3. *Ablabes pavo*, sp. nov.
4. *Japalura bengalensis*, sp. nov.
5. *Lygosoma courcyanum*, sp. nov.

Bennrose, Colle, Derby.



### III. LEPIDOPTERA.

By CAPTAIN W. H. EVANS, R.E.

The collection of Lepidoptera obtained on the Abor Expedition is not a large one, a fact which is doubtless explained by the season during which the military operations were undertaken. In addition to the specimens found by Mr. Kemp, a collection made by Captain H. W. Price of the Supply and Transport Corps and presented by him to the Indian Museum, has been examined while the records of other specimens collected by Major E. H. Sweet of the 2nd Gurkha Rifles are included. Permission to incorporate identifications of the species comprised in the latter collection was obtained through the courtesy of Major E. H. Sweet and the Secretary of the Bombay Natural History Society.

In all seventy-four species have been examined. The order and nomenclature followed in the list is that adopted in my "List of Indian Butterflies" published in the *Journal of the Bombay Natural History Society*, March 31st, 1912.

1. *Danais aglea melanoides*, M.  
    I ♂ Sadiya: Nov. (S.W.K.); I ♀ Kobo: Dec. (S.W.K.)  
    I ♂ "Abor Expedition" (E.H.S.).
2. *Danais melaneus*, Cr.  
    I ♀ Between Kobo and Janakmukh (H.W.P.).
3. *Danais plexippus*, L.  
    I ♂ "Abor Expedition" (E.H.S.).
4. *Euploea diocletianus*, Fab.  
    I ♂ Between Kobo and Janakmukh (H.W.P.).
5. *Ypthima baldus*, Fab.  
    I ♂ "Abor Expedition" (E.H.S.).
6. *Ypthima affectata*, El. and Ed.  
    I ♂ Rotung: March, dry season form (S.W.K.).

Above the specimen is uniform dark brown on the forewing with no male brand: the hindwing has all the ocelli showing and some white powdering on the margin, especially towards the anal angle. Below the ground colour is very dark brown, loosely powdered pale ochreous: the ocelli on the hindwing are minute: there are no distinct bands, but the powdering is darker on the disc of the hindwing, showing up as a dull ochreous irregular patch. The underside resembles in general appearance the underside of *Y. philomela indecora*, M., from the Western Himalayas.

7. *Lethe chandica*, M.  
    I ♂ Rotung: March (S.W.K.).

8. *Mycalesis perseoides khasia*, Evans.  
1 ♂ "Abor Expedition," dry season form (E.H.S.).
9. *Mycalesis visala*, M.  
1 ♂ "Abor Expedition," dry season form (E.H.S.).
10. *Mycalesis meda*, Fab.  
1 ♂, 1 ♀ "Abor Expedition," dry season forms (E.H.S.).
11. *Melanitis leda ismene*, Cr.  
3 ♂, 2 ♀ "Abor Expedition," dry season forms (E.H.S.).
12. *Melanitis phedima bela*, M.  
1 ♂ "Abor Expedition," dry season form (E.H.S.).
13. *Hestina nama*, Db.  
1 ♂ "Abor Expedition" (E.H.S.).
14. *Stibochiona nicea*, Gray.  
1 ♂ Rotung : March (S.W.K.) ; 1 ♀ between Kobo and Janakmukh (H.W.P.).
15. *Liminitis procris*, Cr.  
1 ♂, 1 ♀ Kobo : Dec. (S.W.K.).
16. *Pantoporia zeroa*, M.  
1 ♂ Sadiya : Nov. (S.W.K.).
17. *Neptis hylas varmona*, M.  
1 ♂ Dibrugarh : Nov. (S.W.K.).
18. *Neptis soma*, M.  
2 ♂ Sadiya and Kobo : Nov. (S.K.W.).
19. *Neptis hordonia*, Stoll.  
1 ♂ Kobo : Dec. (S.W.K.).
20. *Cyrestis thyodamas*, Bdl.  
2 ♂ Sadiya : Nov. (S.W.K.).
21. *Junonia iphita*, Cr.  
1 ♂ Sadiya : Nov. (S.W.K.).
22. *Vanessa indica*, Herbst.  
1 ♂ Kobo : Dec. (S.W.K.).
23. *Symbrenthia hippoclus khasiana*, M.  
1 ♂ Sadiya : Nov. (S.W.K.).
24. *Rhinopalpa polynice birmana*, Fruh.  
4 ♂ Kobo : Nov. and Dec. (S.W.K.) ; and between Kobo and Janakmukh (H.W.P.).  
This insect is rare in Assam generally but seems common in the Abor country.
25. *Hypolimnas bolina*, L.  
1 ♂ Between Kobo and Janakmukh (H.W.P.).
26. *Kallima inachus*, Bdl.  
1 ♂ Kobo ; Dec. (S.W.K.) ; 2 ♂ between Kobo and Janakmukh (H.W.P.).

27. *Cynthia erota*, Fab.  
     1 ♂ Between Kobo and Janakmukh (*H.W.P.*).  
 28. *Cirrnochroa aoris*, Db.  
     1 ♂ "Abor Expedition" (*E.H.S.*); 1 ♂ Sadiya: Nov. (*S.W.K.*); 1 ♀ Rotung: Dec. (*S.W.K.*).  
 29. *Argynnис hyperbius*, Joh.  
     1 ♂ Kobo: Dec. (*S.W.K.*); 1 ♀ Sadiya: Nov. (*S.W.K.*).  
 30. *Pseudergolis wedah*, Koll.  
     3 ♂ Kobo: Nov. and Dec and Sadiya: Nov. (*S.W.K.*).  
 31. *Cethosia cyane*, Dr.  
     2 ♂, 1 ♀ Kobo: Dec. (*S.W.K.*).  
 32. *Cethosia biblis*, Dr.  
     1 ♀ Rotung: Dec. (*S.W.K.*).  
 33. *Zemeros flegyas*, Cr.  
     2 ♂ "Abor Expedition" (*E.H.S.*); 1 ♂ Sadiya: Nov. and 2 ♂ Rotung: Dec. and March (*S.W.K.*).

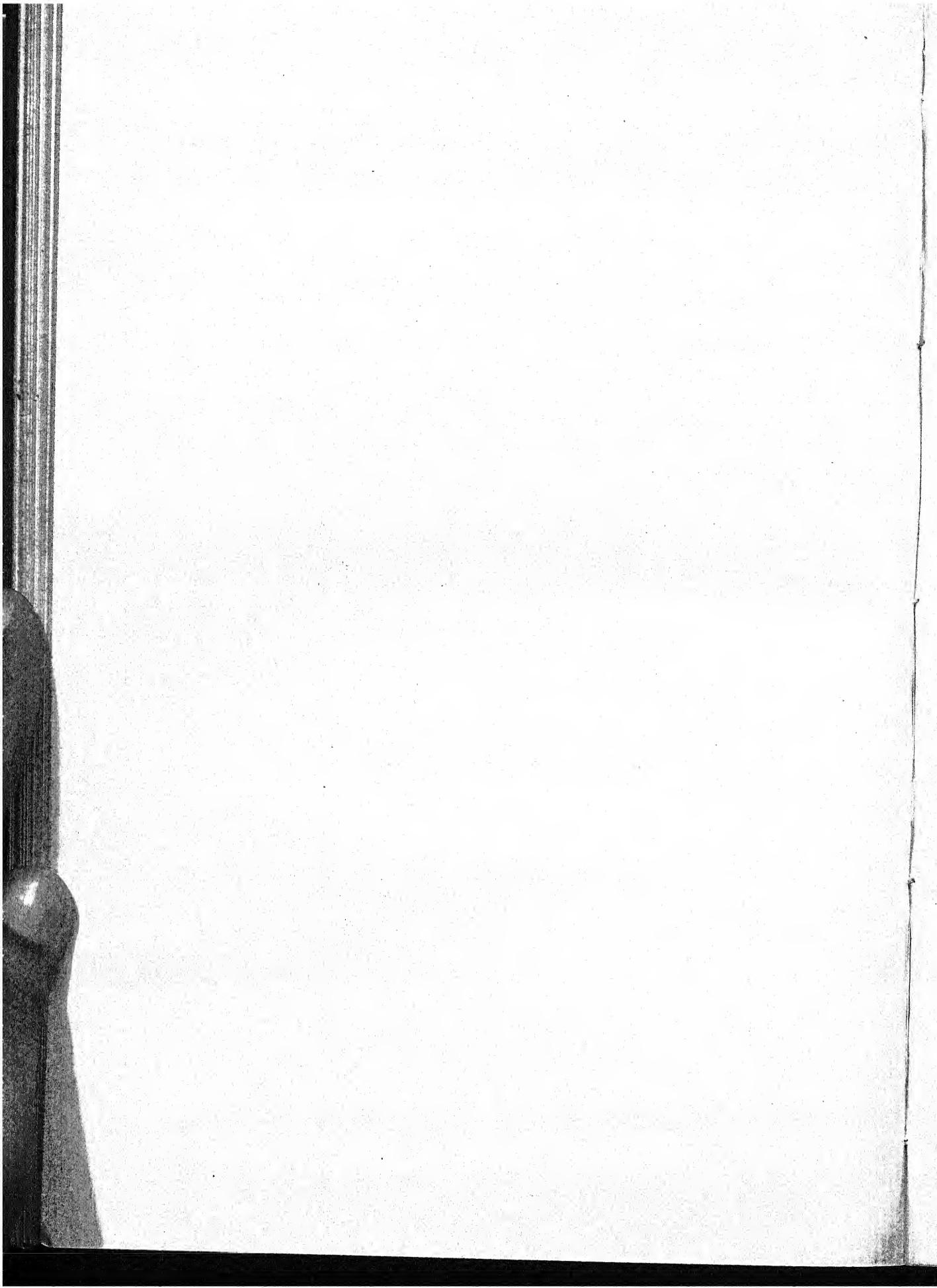
The specimens have the white apical spots well developed, showing a close resemblance to the race *confucius*, Fruh., from Southern Burma.

34. *Papilio philoxenus polyeuctes*, Db.  
     1 ♂ Rotung to Renging (*S.W.K.*).  
 35. *Papilio helenus*, L.  
     1 ♂ "Abor Expedition" (*E.H.S.*); 2 ♀ between Kobo and Janakmukh (*H.W.P.*).  
 36. *Papilio polytes romulus*, Cr.  
     1 ♂ "Abor Expedition" (*E.H.S.*).  
 37. *Papilio memnon agenor*, L.  
     1 ♀ form *butlerianus*, Roth., between Kobo and Janakmukh (*H.W.P.*).  
 38. *Papilio protenor euprotenor*, Fruh.  
     1 ♀ Sadiya: Nov. (*S.W.K.*).  
 39. *Papilio paris*, L.  
     1 ♀ Between Kobo and Janakmukh (*H.W.P.*).  
 40. *Leptocircus curius*, Fab.  
     1 ♀ Sadiya: Nov. (*S.W.K.*).  
 41. *Delias aglaia*, L.  
     2 ♂ Kobo: Dec. (*S.W.K.*).  
 42. *Pieris canidia*, Spaw.  
     1 ♂ Kobo: Dec. (*S.W.K.*).  
 43. *Aphrias lalage*, Db.  
     1 ♂ "Abor Expedition" (*E.H.S.*); 1 ♂ Sadiya: Nov., 3 ♂ Rotung: Dec. and 1 ♂ Kobo: Dec. (*S.W.K.*).  
 44. *Dercas verhueli doubledayi*, M.  
     1 ♂ Rotung: March (*S.W.K.*).

45. *Catopsilia florella*, Fab.  
1 ♂ Sadiya: Nov. (S.W.K.).
46. *Colias fieldii*, Mén.  
2 ♀ near Kaled, 2,500 ft., March (S.W.K.).
- The specimens from the locality should be true *fieldii*, but are small and dull resembling the western *edusina*, But., more than the Chinese *fieldii*, Mén.
47. *Terias hecabe*, L.  
3 ♂ Kobo: Dec. and 1 ♀ Sadiya: Nov., dry season forms (S.W.K.)
48. *Terias silhetana*, Wall.  
1 ♀ Kobo: Dec., dry season form (S.W.K.).
49. *Hebomoia glaucippe*, L.  
1 ♀ Between Kobo and Janakmukh (H.W.P.).
50. *Paveronia avatar*, M.  
1 ♂ "Abor Expedition" (E.H.S.).
51. *Neopithecops zalmora*, But.  
2 ♂ Rotung: Dec. and March (S.W.K.).
52. *Cyaniris transpecta*, M.  
1 ♂ Sadiya: Nov. and 2 ♂, 1 ♀ Kobo: Dec. (S.W.K.).
53. *Cyaniris dilecta*, M.  
1 ♂ Rotung: Dec. (S.W.K.).
54. *Cyaniris limbata placida*, de N.  
2 ♂ Kobo: Dec., dry season forms (S.W.K.).
55. *Catochrysops strabo*, Fab.  
1 ♂ Kobo: Dec. (S.W.K.).
56. *Castalius rosimon*, Fab.  
2 ♂ Sadiya: Nov. (S.W.K.); 1 ♀ "Abor Expedition". (E.H.S.).
57. *Castalius elna*, Hew.  
1 ♂ Sadiya: Nov. and 2 ♂, 2 ♀ Kobo: Dec. (S.K.W.).
58. *Lycaenesthes emolus*, God.  
1 ♂ Sadiya: Nov. (S.W.K.).
59. *Nacaduba bhutea*, de N.  
1 ♂ Kobo: Dec. (S.W.K.).
60. *Nacaduba nora*, Fd.  
1 ♂ Rotung: Dec. (S.W.K.).
61. *Nacaduba noreia*, Fd.  
1 ♂ Kobo: Dec. (S.W.K.).
62. *Lampides bochus*, Cr.  
1 ♀ Sadiya: Nov. (S.W.K.).
63. *Lampides elpis*, God.  
1 ♂ Kobo: Dec., typical and 1 ♂ Rotung: March (S.W.K.).

The specimen from Rotung has the border above reduced to a fine line, as in *pura*, M., and below all the markings very dull.

64. *Polyommatus boeticus*, L.  
     2 ♂ Rotung : March (S.W.K.).
65. *Poritia hewitsoni tavoyana*, Doh.  
     2 ♂, 2 ♀ Between Kobo and Janakmukh (H.W.P.).  
     The females have the lower part of the forewing very pale blue, while the orange spot, prominent in true *hewitsoni*, is only faintly indicated in one specimen and absent in the other.
66. *Ilerda epicles*, God.  
     3 ♂ Sadiya : Nov., 2 ♂ Kobo : Dec. and 1 ♂ Rotung : Dec. (S.W.K.).
67. *Arhopala silhetensis*, Hew.  
     1 ♀ Dibrugarh : Nov. (S.W.K.).
68. *Rapala schistacea*, M.  
     1 ♂ Kobo : Dec. (S.W.K.).
69. *Hypolycaena erylus*, God.  
     1 ♂ Kobo : Dec. (S.W.K.).
70. *Cheritra freja*, Fab.  
     1 ♀ Kobo : Dec., dry season form (S.W.K.).
71. *Zeltus etolus*, Fab.  
     3 ♂ Kobo : Dec. and 3 ♂ Sadiya : Dec. (S.W.K.).
72. *Loxura atymnus*, Cr.  
     1 ♂ Dibrugarh : Nov. and 1 ♂ Sadiya : Nov. (S.W.K.).
73. *Ampittia maro*, Fab.  
     1 ♂ "Abor Expedition" (E.H.S.).
74. *Rhopalocampta benjamini*, Guér.  
     1 ♂ Rotung : March (S.W.K.).



#### IV. PORIFERA.

By N. ANNANDALE, D.Sc., F.A.S.B., Superintendent of the  
Indian Museum.

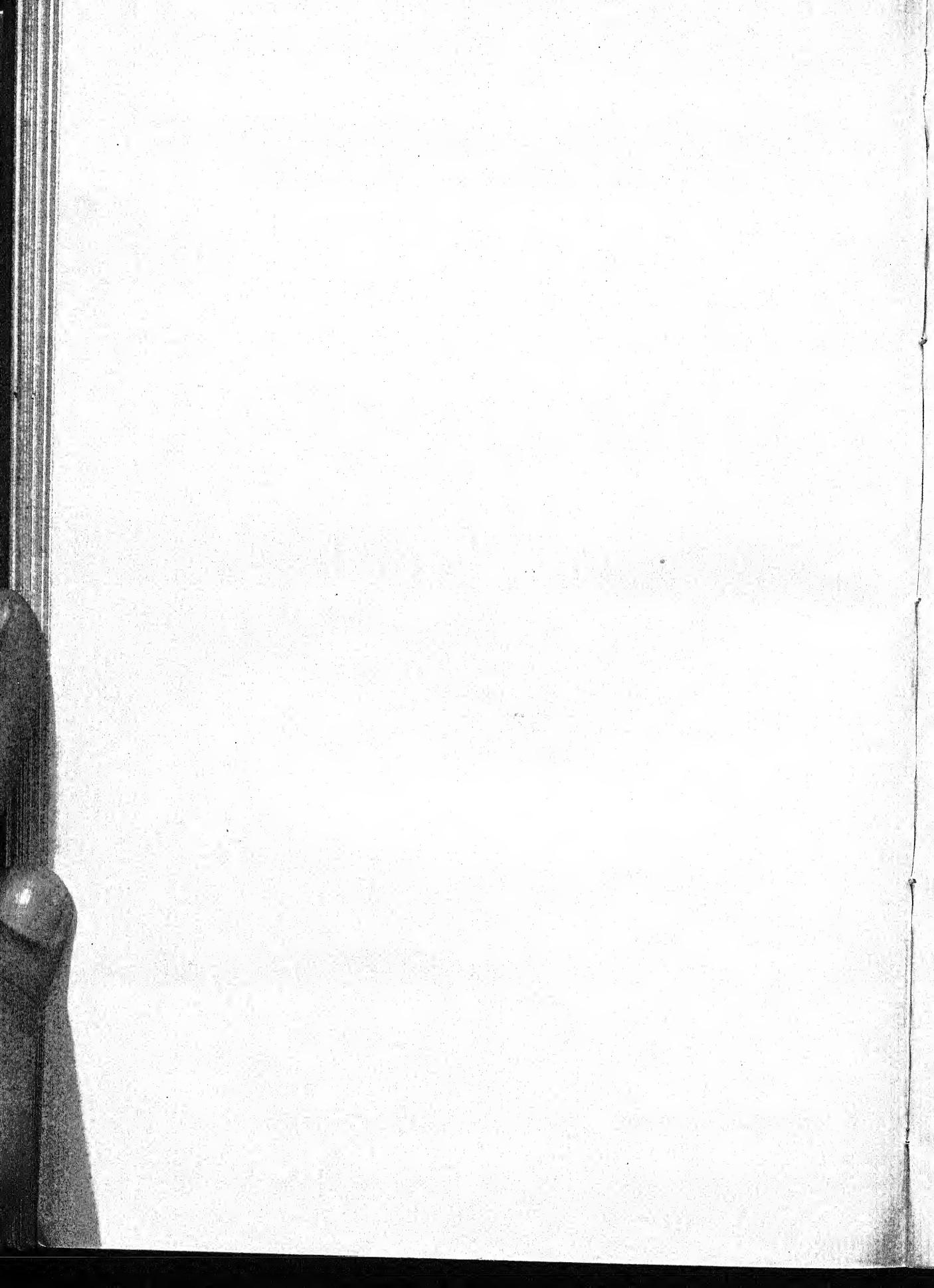
In the absence of ponds, lakes and slow-running streams it was not to be expected that sponges would be found in the Abor country, but two species were obtained by Mr. Kemp and Mr. J. Coggan Brown of the Geological Survey in N.-E. Assam. The only species hitherto found in Assam was *Spongilla* (*Euspongilla*) *proliferens*, Annandale, which was taken near Mangaldai to the north of the Brahmaputra by Mr. Kemp on a former occasion and is widely distributed in the Oriental Region. Specimens were found by Messrs. Kemp and Brown on their way to the Abor country at Dibrugarh on the south bank of the Brahmaputra. The same collectors obtained specimens of another sponge (*Spongilla* (*Eunapius*) *crassissima* var. *crassior*, Annandale) in a small muddy pond at Mariani in the Sibsagar district. This form had only been found hitherto at Rajshai (Rampur Bhulia) on the north bank of the Ganges in Bengal, while the typical form of the species is only known from the Gangetic delta and Orissa.

All the specimens from N.-E. Assam were preserved in November. Although apparently killed during a period of full vegetative vigour, they are full of gemmules.

I can detect no buds on the examples of *S. proliferens*, but these structures, although characteristic of the species, are not always present. The gemmules possess well-formed foraminal tubules.

The specimens of *S. crassissima* var. *crassior* agree well with the types except in being of a bright green colour. In external appearance (except as regards colour) they closely resemble *S. decipiens calcuttana*, which belongs to the same subgenus, but they can be easily distinguished therefrom by their much stouter megascleres and more compact skeleton.

*S. proliferens* is fully described on pp. 72-76 of my volume in the "Fauna" on the Freshwater Sponges, etc. and *S. crassissima* and its variety on pp. 98 and 99 of the same work.



## V. SCOLOPENDRIDAE.

By F. H. GRAVELY, M.Sc., Assistant Superintendent,  
Indian Museum.

Out of the eight species collected two are new, one is only known from the E. Himalayas and Assam; but all the rest occur south and in most cases west of this area as well.

### Subfamily CRYPTOPINAE.

#### Genus *Cryptops*.

##### *C. doriae*, Pocock.

Renging, 2,150 ft., 19-xii-11 (under bark).

This species has hitherto been recorded from the area between and including New Guinea and Burma. It must extend westwards right across India, however, for I recently obtained specimens from Taloshi (Satara District, Bombay) at an altitude of about 2,000 ft. in the Western Ghats.

### Subfamily OTOSTIGMINAE.

#### Genus *Otostigmus*.

##### *O. burn-murdochii*, n. sp.

Upper Rotung, ca. 2,000 ft., Jan., 1912.

Collected by the 32nd Sikh Pioneers when roadmaking and named after Mr I. Burn-Murdoch of that regiment.

*Description.*—Length (apart from appendages) up to 63 mm. Antennae 19-jointed (rarely 17-jointed on one side and 19-jointed on the other, the terminal joint being present in both), the first three joints large, polished and hairless, the rest smaller and pilose. Dorsal surface of head and body dark olive green, finely and sparsely but evenly punctured throughout, the punctures on the head and first one or two segments often a trifle larger and less clearly defined than the rest; segments 3-20 with a pair of very fine and sometimes incomplete longitudinal grooves; these grooves usually more strongly impressed close to the posterior margin especially in the anterior or middle segments of the body, where they are often joined by a transverse groove between which and the posterior margin the surface may be rugose. Marginal grooves present behind segments 8-11. Anal segment

laterally with strong marginal ridges; posterior margin composed of two straight halves meeting in an angle of about  $120^{\circ}$ . Ventral surface paler than dorsal, similarly punctured, but without grooves; sternocoxal plate armed with five strong teeth (sometimes four or six on one side only). Sternum of anal segment narrower behind than in front, posterior margin more or less concave. Pseudopleural processes at least as long as sternum of anal segment, sometimes very slender behind, armed with 1-2 distal, 1-2 external, and 1-4 dorsal spinules. Tooth on inner side of femur of poison-jaws strongly developed. Legs distally of a more bluish tinge than the body. First pair of legs armed with 1 distal spine on the patella, 1 on the tibia, 2 on the proximal tarsus, and 2 at the base of the claw; second with 2 spines on the proximal tarsus and claw, with or without 1 on the tibia; third to twentieth with 2 at the base of the claw, 1, or usually in many of the anterior segments 2, at the end of the proximal tarsus; anal legs with 2 at the base of the claw only; femur of anal legs with a strong dorsal tooth on the inner side at the end ("eckdorn") with 1-3 smaller teeth behind it, beneath on the outer side with 3, on the inner with 2, 2-3, 3 teeth often irregularly arranged.

This species is allied to those grouped under the number 5 in Kraepelin's table [Revision der Scolopendriden, p. 99, in Mitt. Naturhist. Mus. Hamburg, XX, 1902 (1903)]. It differs from all of them, however, in combining the presence of external spinules on the pseudopleural processes with the absence of longitudinal grooves on the sterna.

#### *O. insularis*, Haase.

Kobo, 400 ft., 8-xii-11.

Rotung, 1,300-1,400 ft., 31-xii-11 and 1-i-12.

This species is recorded from the Seychelles, Ceylon, the Philippines, and the E. Himalayas.

Several specimens have recently been added to the Museum collection. In addition to the Abor records above noted, the following localities may be given:—

Ceylon: Kandy and Peradeniya, 1,500-2,000 ft.

E. Himalayas: Darjiling District—Ghumti, ca. 1,800 ft.

Assam: Mangaldai District—Assam-Bhutan Frontier.

Dikrang Valley.

Malay Peninsula: Penang.

Individuals differ greatly one from another in many respects. Kraepelin has pointed out that the Himalayan form differs from the Ceylon one in having only two instead of two and half segments of the antenna smooth and hairless. This is confirmed by the specimens I have seen, the Penang specimen agreeing with the Himalayan ones in this respect, but as two of the Himalayan ones have two and half segments bare on one antenna I am inclined to think he was right in not giving the two forms separate

varietal names. Great differences are also found in the size, proportions, and femur-armature of the anal legs. Our Ceylon specimens agree more or less perfectly with Kraepelin's description, but in the Himalayan ones the number of spines on the femur is commonly less and the femur as a whole is apt to be shorter; neither of these characters seems, however, to be constant nor are the shortest femora necessarily those with the fewest spines. This frequent reduction of the number of spines on the femora brings the species still nearer to *O. scaber*, Pocock, and although I have never yet seen a specimen with two tarsal spurs on the legs of less than about eighteen segments I cannot help thinking that the two will in course of time prove to be identical. The pseudopleural processes are also subject to variation, and the distinctness of the longitudinal keels, as well as the presence or absence of a pair of longitudinal grooves and the whole texture of the dorsal surface, is extraordinarily variable. The dorsal surface may be smooth and polished between the keels throughout, or may be granular or finely spinulose laterally, or finely spinulose throughout.

#### *O. rugulosus*, Por.

- Sadiya, N.-E. Assam, 25-xi-11.  
 Kobo, 400 ft., 30-xi—3-xii-11 (rotten wood).  
 Rotung, 1,300 ft., 30-xii-11 (under stones).  
 Renging, 2,150 ft., 19-xii-11 (rotten wood).

Previously recorded only from the Seychelles, Mauritius, Andamans, Burma, and Siam. There are however also specimens in the Indian Museum collection which were recently collected by Mr. Kemp in Assam as far west as Mangaldai and the Assam-Bhutan frontier north of that district.

The extent to which the longitudinal grooves of the sterna are developed varies greatly; and in one or two of the Kobo specimens they are entirely absent.

#### Genus *Rhysida*, Wood.

##### *R. nuda* (Newp.).

- Dibrugarh, N.-E. Assam, 17—21-xi-11.  
 Sadiya, N.-E. Assam, 25-xi-11.

This species occurs throughout the Oriental Region and also in Australia and Paraguay. The specimens from the Abor country are nearer *R. immarginata* (Por.) than *R. nuda* as these species are defined by Kraepelin (loc. cit., pp. 141 and 143-4), but as specimens combining the characters of the two seem to be far commoner in India than the latter and quite as common as the former, I feel unable to separate them, and Newport's name has priority over Porat's. Complete or incomplete marginal grooves are often present on several segments in front of the twenty-first, which alone has strong marginal ridges.

**R. cuprea, Krpln.**

Kobo, 400 ft., 30-xi—3-xii-11 (one in rotten wood and one in earth).

Balek, 600 ft., 24-iii-12.

Up to the present the only published record for this species is Bhutan. The Indian Museum has, however, recently received specimens from the following localities :—

E. Himalayas : Darjiling District—Kurseong, ca. 5,000 ft.;  
Ghumti Tea Estate, ca. 4,000 ft.

Assam : Sylhet—Shamshernager, ca. 100 ft.

This species is much nearer *R. stuhlmanni*, Krpln., and *R. petersi* (Por.) from Africa than Kraepelin supposed; for the fourth joint of the antenna is often broader than long, the first stigmata may approach an  $\omega$ -shape, the pseudopleura may be terminated by 3 instead of 2 spines, and the nineteenth and twentieth legs may have 2 and 1 instead of 1 and 0 tarsal spurs respectively. It can be distinguished however by its 20-21-jointed antenna. In one specimen one of the antennae is only 18-jointed and has the terminal segment present, but presumably this is due to regeneration after mutilation.

Genus **Ethmostigmus, Poc.****E. pygomegas (Kohlr.).**

Kobo, 400 ft. (rotten wood).

Upper Rotung, ca. 2,000 ft. (collected by M. de Courcy).

This species is found throughout the E. Himalayas, Assam, Burma and the Nicobars.

Subfamily **SCOLOPENDRINAE.**Genus **Scolopendra (L.) Newp.****S. mazbii, n. sp.**

Upper Rotung, ca. 2,000 ft., Jan., 1912.

One small specimen was found under the leaf-stem of a plantain; the rest were obtained by Capt. the Hon. M. de Courcy and the 32nd Sikh Pioneers when road-making; the name chosen for the species is taken from that of the caste to which the men of this regiment belong.

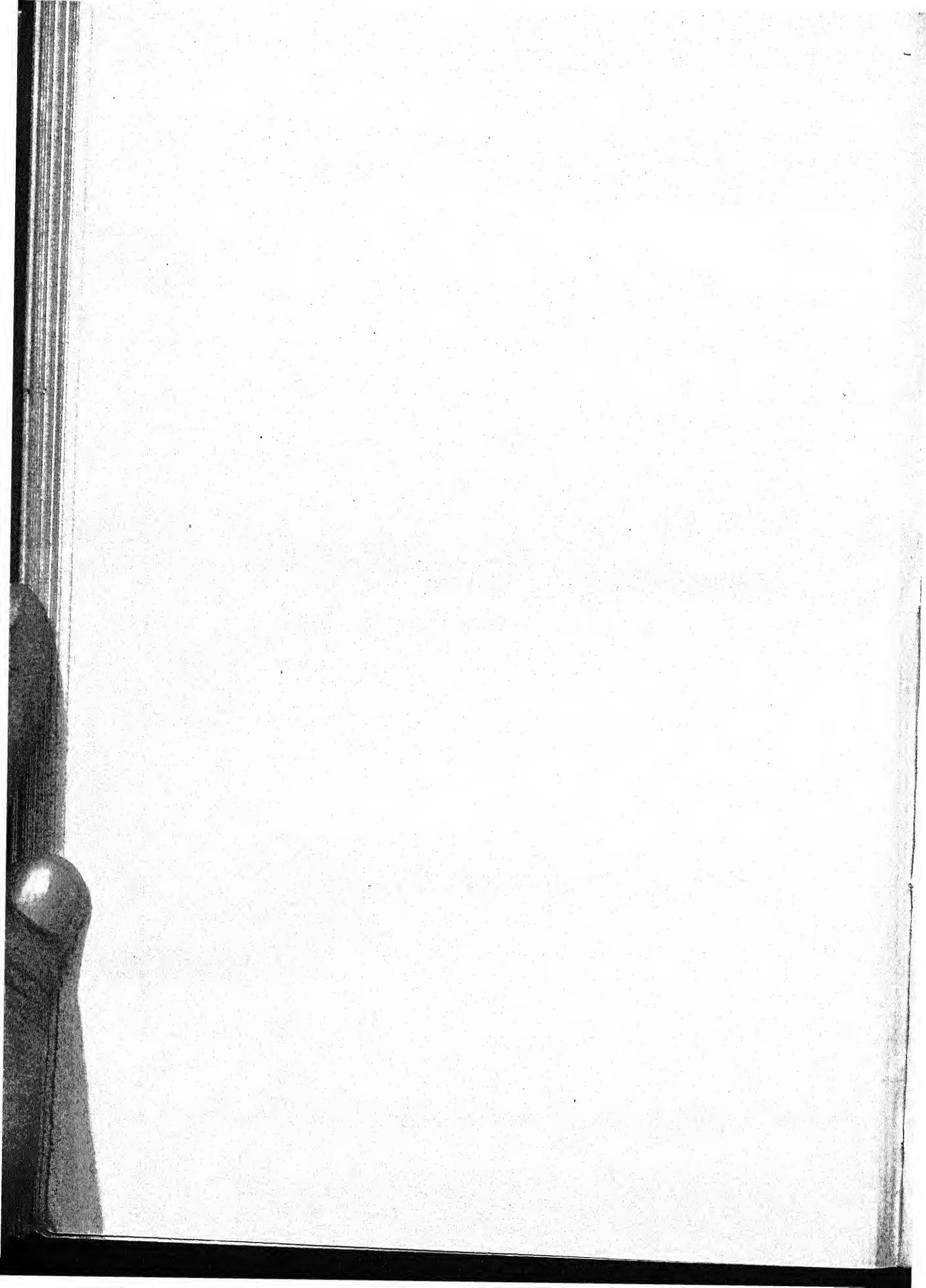
*Description.*—Length (apart from appendages) up to 95 mm. Antennae 17-jointed, the first five joints hairless, the rest uniformly pubescent throughout. Dorsal surface of head dark bluish in front, pale greenish behind, marked with a fine longitudinal groove in the middle line. First segment also pale greenish above, with or without the fine median groove; second and third segments dark bluish with a pair of distinct longitudinal grooves;

remaining segments with the exception of the last olivaceous in front with a dark bluish band along the posterior margin<sup>1</sup> and a pair of distinct longitudinal grooves throughout, about half of these segments with raised lateral margins; last segment olivaceous, little darker behind than in front, entirely without paired or median grooves, lateral margins very strongly raised, posterior margin curved. Ventral surface uniformly olivaceous or with head and first segment browner or paler than the rest; sternocoxal plate armed with 5 minute and widely separated teeth, sterna of segments 2-19 or 20 with a pair of distinct longitudinal grooves; sternum of the last segment rather slender, narrower behind than in front, posterior margin straight or very nearly so. Pseudopleural processes conical, rather slender, the apex simply pointed. Tooth on inner side of femur of poison-jaws strongly developed; first pair of legs paler in colour than the rest, legs 1-19 armed with 1 tarsal and 2 claw spurs, the twentieth with 2 claw spurs and 0(-1) tarsal spurs, the anal legs usually without spurs, sometimes, however, with 1 claw-spur. Femur of anal legs armed normally with 2,2 ventral outer, 2 ventral inner, 2 dorsal inner and 1 long and always simply pointed posterior dorsal spine; the arrangement, however, is sometimes less regular than this when one or two additional spines are developed; and the proximal ventral spine is often so much reduced that it is not improbable that it may occasionally be absent. Distal tarsus of anal leg moderately slender in young specimens; much stouter proportionally in adults in which it is sometimes actually shorter than the very large claw.

This species comes next to *S. morsitans* when compared with Kraepelin's table (loc. cit., pp. 226-232), but can be distinguished therefrom at once by the simply pointed pseudopleural processes and the similarly simple posterior dorsal spine ("eckdorn") of the anal legs as well as by other minor characters.

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<sup>1</sup> Mr. Kemp informs me that the colours were much more brilliant in life, the ground colour which is now olivaceous being then a straw-yellow.



## VII. HYMENOPTERA ANTHOPHILA.

By C. A. PAIVA, Assistant, Indian Museum.

Among the Hymenoptera collected during the Abor Expedition there are 40 specimens of Bees, most of which appear to be fairly widely distributed. I have been able to accurately identify most of them, but there are a few the identity of which I am not quite sure about. I therefore propose to leave them undetermined for the present.

### 1. *Sphecodes*, sp.

One male collected at Sadiya, N.-E. Assam, on the 27-xi-ii (*Kemp*).

A genus very widely distributed in both hemispheres.

### 2. *Halictus*, spp. ( $\sigma \sigma$ ).

There seem to be at least two species among the 3 specimens of this genus which were collected at Sadiya, 28-xi-ii, and Dibrugarh, 11—19-xi-ii, N.-E. Assam and at Kobo, 400 ft., 3-xii-ii (*Kemp*). Those from Sadiya and Kobo come very near *H. funebris*, Cam., and the one from Dibrugarh agrees with the description of *Halictus pulchiventris*, Cam., differing only in having the 2nd joint of the flagellum of the antenna black beneath instead of testaceous yellow.

There is also a very badly preserved female belonging to this genus collected at Sadiya, N.-E. Assam, 28-xi-ii (*Kemp*).

### 3. *Halictus rufo-zonatus*, Vachal.

Ann. Mus. Civ. Genoa (2a), 1894, p. 442, ♀ ; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 439, ♀.

Six females were found under bark at Renging, ca. 2,150 ft., 19-xii-ii (*Kemp*).

Bingham records the species from Bhamo, Upper Burma.

### 4. *Andrena mollis*, Smith.

New Sp. Hym. B. M., p. 50, ♀ ; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 446.

Three specimens were collected at Sadiya, N.-E. Assam, 28-xi-ii, and two at Dibrugarh, N.-E. Assam, 17—19-xi-ii (*Kemp*).

Recorded by Bingham from Bombay, Assam, Burma and Tenasserim.

Represented in the Indian Museum collection from United Provinces :—Jhansi, 850 ft., 2-viii-05 (*Brunetti*).

U. Burma :—Rangoon, 12-vi-97 (*Bingham*).

E. Himalayas :—Sukna, 500 ft., 2-viii-08 (*Annandale*).

A very variable species.

#### 5. *Nomia aurifrons*, Smith.

Trans. Ent. Soc. London, 1875, p. 43, ♀; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 455; Paiva, Rec. Ind. Mus., i, pt. i, 1907, p. 16.

One specimen from Dibrugarh, N.-E. Assam, 11—19-xi-11 (*Kempf*).

Recorded by Bingham from Bengal, Sylhet, Burma and Tenasserim.

Represented in the Indian Museum collection from Katmandu, Nepal Valley, 4,500 ft., Oct., 1906, and from Nagarkote, Nepal, ca. 6,000 ft., Oct., 1906 (*Hodgart*).

Represented in the Pusa collection from Bihar :—Pusa, Chupra.

#### 6. *Nomia terminata*, Smith.

Trans. Ent. Soc. London, 1875, p. 56; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 459; Paiva, Rec. Ind. Mus., i, pt. i, 1907, p. 16.

Three specimens taken at Kobo, 400 ft., 6—8-xii-11 (*Kempf*).

Recorded by Bingham from Sikhim, Burma and Tenasserim.

Represented in the Indian Museum collection from Assam :—Margherita.

E. Himalayas :—Sureil, Darjiling district, 5,000 ft., April, 1905 (*Alcock*).

#### 7. *Lithurgus dentipes*, Smith.

Cat. i, p. 146, ♂; Horne, Trans. Zool. Soc. Lond., vii, 1872, p. 175; Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 470.

One specimen from Sadiya, N.-E. Assam, 27-xi-11 (*Kempf*).

Recorded by Bingham from Sikhim; Manipuri, N.-W.P. (*Horne*); Tenasserim and New Holland (*Smith*).

Not previously represented in the Indian Museum collection.

Represented in the Pusa collection from Bihar :—Pusa, Chupra.

#### 8. *Ceratina hieroglyphica*, Smith.

Cat. ii, 226, ♀ ♂; ? *Ceratina flavopicta*, Morawitz (nec Smith), Hor. Soc. Ent. Ross., xxiv, 1890, p. 356. *Ceratina hieroglyphica*, Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 503, pl. iv, fig. 3; Rec. Ind. Mus., ii, 1908, p. 365.

One specimen from Sadiya, N.-E. Assam, 28-xi-11 (*Kempf*).

Bingham records it from Mussoorie, Dehra, Barrackpore, Sikhim, Bangalore, Assam, Burma and Tenasserim extending into China and the Malayan region.

Represented in the Indian Museum collection from Kashmir, 8,000--9,000 ft.

W. Himalayas :—Mussoorie, ca. 7,000 ft., 20—26-v-05 (*Brunetti*).

Bihar :—Barh (*Burkill*).

Bengal :—Calcutta ; Khulna, 10-iii-07 (*Caunter*).

Assam :—Sadiya and Margherita.

Borneo :—10 miles south of Kuching, Sarawak, 24-vi-10 (*C. W. Beebe*).

Represented in the Pusa collection from Bihar :—Pusa, Chupra, Daulatpur, Darbhanga.

W. Himalayas :—Mussoorie, 7,000 ft.

Bombay :—Kanara, Belgaum, 2,500 ft.

#### 9. *Crocisa emarginata*, Lepel.

Lepeletier, Hym., ii, p. 449, ♀ ♂ ; Smith, Cat. Hym. Ins. B.M., ii, p. 277 ; Journ. Linn. Soc., xi, 1876, p. 390. *Crocisa decora*, Smith, Trans. Ent. Soc. London, n.s., ii, 1852, p. 41, ♀. *Crocisa elegans*, Smith (*nec Moscary*), New species Hym. B.M., p. 107, ♀. *Crocisa emarginata*, Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 517 ; Proc. Zool. Soc. London, 1896, p. 454 ; Paiva, Rec. Ind. Mus., i, 1907, p. 16.

One specimen from Dibrugarh, N.-E. Assam, 19-xi-11 (*Kemp*).

Recorded by Bingham from Sikkim, Calcutta, Bombay, Malabar, Ceylon, Pundaloya (*Green's coll.*), Burma and Tenasserim ; on the west extending to South Africa, on the east to China and the Malay Archipelago.

Represented in the Indian Museum collection from Bombay :—Poona Ghats.

United Provinces :—Lucknow.

Bengal :—On the road from Magra to Trebeni, Hooghly district, 31-vii-09 (*Mus. collr.*) ; Basanti Forest Station, Sunderbuns, L. Bengal, 16-xi-09 (*Jenkins*) ; Calcutta, 7-xi-06 (*Brunetti*), 9-vi-09 (*Mus. collr.*)

Nepal :—Soondrial, Nepal Valley, 1906 (*Hodgart*).

Assam :—Sibsagar ; Margherita ; Naga Hills.

S. India :—Bangalore ; Oorgaum, ca. 2,500 ft., 20-x-10 (*Mus. collr.*).

U. Burma :—Between Tengueh and Tali Fu, Yunnan, W. China, 1909-10 (*J. Coggan Brown*).

L. Burma :—Moulmein ; Mergui ; Tenasserim.

Ceylon :—Kandy, vi-10.

Malay Archipelago :—Sinkep I.

Malay Peninsula :—Pérapak.

Represented in the Pusa collection from S. India :—Naduvattam, 7,000 ft., Nilgiris.

Bengal :—Madhyapara, Dacca district.

Bombay :—Belgaum, 2,500 ft.

IO. *Habropoda fulvipes*, Cam.

Cameron, Ann. Mag. Nat. Hist., xiii (7th series), 1904, p. 211.

One specimen in very good condition taken in a jungle path, Sadiya, N.-E. Assam, 23-xi-11 (*Kemp*).

Originally described from Khasi Hills (*Rothney coll.*).

Not previously represented in the Indian Museum collection.

II. *Anthophora zonata*, Linn.

*Apis zonata*, Linn. Syst. Nat. (ed. 10), i, p. 576. *Anthophora subcaerulea*, Lepel. Hym., ii, p. 30, ♀♂. *Anthophora zonata*, Bingham, Proc. Zool. Soc. Lond., 1896, p. 455; Faun. Brit. Ind. Hym., i, 1897, p. 527; Paiva, Rec. Ind. Mus., i, 1907, p. 16.

One specimen from Sadiya, N.-E. Assam, 23-xi-11 (*Kemp*).

Recorded by Bingham from all over India, Burma, Tenasserim and Ceylon, extending through the Malay regions to Australia.

Represented in the Indian Museum from W. Himalayas:—  
Mussoorie, ca. 7,000 ft., 20—24-vi-05 (*Brunetti*); Almora, Kumaon, ca. 5,500 ft., 15-vii-11 (*Paiva*); Kalka, base of Simla Hills, alt. 2,400 ft., 18-vii-11 (*Mus. collr.*).

United Provinces:—Dehra Dun, base of W. Himalayas; Kaladhunji, Naini Tal district (plains) 20-iv-09 (*Mus. collr.*); Meerut, 25-iv-05 (*Brunetti*).

E. Himalayas:—Sikkim; Siliguri, base of E. Himalayas.

Bihar:—Rajmahal, 5-vii-09 (*Annandale*); Barh (*Burkhill*).

Chota Nagpur:—Paresnath, 4,300—4,400 ft., 15-iv-09 (*Annandale*).

Bengal:—Murshidabad; Calcutta, 23-iv-07, 27-v-09, 9-vi-09; Netrakona, Mymensingh district, 4-x-09 (*Bagchi*).

Assam:—Margherita; Sadiya; Naga Hills; Sibsagar; Mazarbat, Mangaldai district, 11—15-ix-10 (*Kemp*).

Burma:—Tenasserim Valley.

Madras:—Gopkuda I., Lake Chilka, Ganjam, N.-E. Madras, 7—15-viii-07; S. end of Lake Chilka, N.-E. Madras, 4-iii-10 (*Annandale*).

S. India:—Bangalore; Shasthancottah, 12 miles N.-N.-E. of Quilon; Trivandrum, 6-xi-08 (*Annandale*); Ayasamtengi, S. end of Lake Kayankulum, Travancore, 6-xi-08; Maddathoray, W. base of W. Ghats, Travancore, 17-xi-08 (*Annandale*); Trivandrum, August, 1903, November, 1890.

Ceylon:—Peradeniya, 10-vii-10, 24-v-10, June, 1910.

Malay Peninsula:—Perak.

Represented in the Pusa collection from Bihar:—Pusa, Chupra:

Orissa:—Cuttack.

Central Provinces:—Bilaspur.

Bombay:—Matheran, 2,500 ft.

12. *Xylocopa latipes* (Drury).

*Apis latipes*, Drury, Ill. Exot. Insects, ii, pl. 48, fig. 2. *Xylocopa latipes*, Fab. Syst. Piez., p. 337; Smith Cat., ii, p. 353; Trans. Ent. Soc. Lond., 1874, p. 267; Bingham, Proc. Zool. Soc. Lond., 1896, p. 456; Faun. Brit. Ind. Hym., i, 1897, p. 536, pl. iv, fig. 7; Cameron, Faun. and Geo. Mald. and Lacc. Arch., vol. i, Hym., 1900-1903, p. 62.

One specimen from Sadiya, N.-E. Assam, 27-xii-11 (*Kemp*).

Recorded by Bingham from Sikkim, Barrackpore, Kumaon, Terai, Central India, Malabar, Coonoor, Assam, Burma, Tenasserim extending to China and the Malayan region.

Cameron records it from Mamaduwari, Mahlos Atoll, Maldives.

Represented in the Indian Museum from E. Himalayas:—  
Sikkim; Tindharia, 2,820 ft. (*Richardson*).

United Provinces:—Saharanpur.

Chota Nagpur:—Ranchi.

Bengal:—Murshidabad; Calcutta.

Assam:—Shillong; Margherita; Naga Hills; Sibsagar; Mazzbat, Mangaldai district, 11-15-x-09 (*Kemp*).

Burma:—Tenasserim; Tavoy; Mergui.

S. India:—Bangalore; Trivandrum, Travancore; S. Malabar.

Ceylon:—Colombo, 25-vi-4.

Malay Archipelago:—Sinkep I.

Malay Peninsula:—Perak; Johore.

Borneo:—Kapit, Sarawak, 21-vii-10 (*Beebe*); Sandakan.

Represented in the Pusa collection from Assam:—Naharkatia; Nangpoh, 3,000 ft. to 5,000 ft., Khasi hills.

13. *Xylocopa collaris*, Lép.

Lepeletier, Hym., ii, p. 189, ♀; Smith Cat., ii, p. 353; Journ. Linn. Soc., xi, p. 393; Trans. Ent. Soc. Lond., 1874, p. 270. *Xylocopa dejeanii*, Lepel. Hym., ii, p. 209, ♂; Smith, Cat. Hym. Insects B.M., ii, p. 357; Journ. Linn. Soc., xi, p. 394. *Xylocopa collaris*, Bingham, Proc. Zool. Soc. Lond., 1896, p. 456; Faun. Brit. Ind. Hym., i, p. 543.

Seven females and two males from Yembung, 1,100 ft., taken on the 14-i-12, boring into rotten wood, and another taken at Rotung, 1,400 ft. in rotten wood on 23-xii-11 (*Kemp*).

Recorded by Bingham from Sikkim, Allahabad, Kumaon, Burma, Tenasserim, Ceylon (Pundaloya), extending into the Malay region and Siam.

Represented in the Indian Museum collection from Tibet (*Moller*).

W. Himalayas:—Simla.

E. Himalayas:—Sikkim.

Assam:—Naga Hills; Sibsagar; Sadiya; Margherita.

Burma:—Mergui; Upper Tenasserim.

S. India :—Trivandrum, Feb., 1893.

Malay Peninsula :—Johore.

Represented in the Pusa collection from Bengal :—Buxa Duars.

#### 14. *Bombus orientalis*, Smith.

Cat. ii, p. 402, ♀. *Bombus buccinatoris*, Sm., New Sp. Hym.

Ins. B.M., p. 132, ♀. ? *Bombus simulus*, Grib., Bull Ent. Soc. Ital., xxiii, 1891, p. 114, ♀. *Bombus orientalis*, Bingham, Faun. Brit. Ind. Hym., i, 1897, p. 555, pl. iv, fig. 9; Paiva, Rec. Ind. Mus., i, 1907, p. 17.

Two specimens from Rotung, 1,400 ft., 26—27-xii-11, one from near Renging, 1,500 ft., 19-xii-11, and one from Sirpo, ca. 1,300 ft., March, 1912 (*Kemp*).

The specimens vary very much in size, the smallest is 12 mm., the next 15 mm. and the largest 26 mm. in length.

Recorded by Bingham from Sikkim, Kunawar. "One of the commonest species about Darjiling" (*Bingham*).

Represented in the Indian Museum collection from Nepal :—Katmandu, Nepal Valley, 4,500 ft., Oct., 1906; Soondrijal, Nepal Valley; Chitlong, little Nepal Valley; Chandragiri, ca. 8,000 ft., Oct., 1906 (*R. Hodgart*).

E. Himalayas :—Sikkim; Kurseong, 4,700—5,000 ft., 22, 24, 25-vi-10, 5, 7, 9-ix-09 (*Annandale*); 6,000 ft., 13-x-09 (*D'Abreau*); Gumti, Darjiling district, ca. 4,000 ft., vii-11 (*Gravely*).

Assam :—Cheera Punji, Khasi Hills (*Warren*).

W. Himalayas :—Kanaul, British Garhwal, 18-x-07 (*Mus. collr.*).

Represented in the Pusa collection from E. Himalayas :—Phoobsering, Lebong, Darjiling district.

It might be useful to note that each of the species *Bombus orientalis* and *B. haemorrhoialis*, which to the casual observer would appear alike, has its range of distribution quite distinct. *B. orientalis*, though recorded so far west as Kanaul in British Garhwal, is not met with in any of the western ranges of the Himalayas. It is found as far west as the western borders of Nepal and probably in some of the Kumaon Hills, where the two species may meet. *B. haemorrhoialis* though described from Chusan in the hills of North China, has not yet been found in any Indian locality to the east of the Kumaon Hills. I found it in fairly large numbers in Almora, visiting roses.

#### 15. *Apis dorsata*, Fab.

Fabricius, Ent. Syst., ii, p. 328; Syst. Piez., 370; Smith, Cat., ii, p. 415; Journ. Linn. Soc., xi, 1876, p. 396; Horne, Trans. Zool. Soc. Lond., vii, p. 181, pl. 22, fig. 3; Lep., Hym., i, p. 405, ♀. *Apis testacea*, Sm., Journ. Linn. Soc., ii, 1858, p. 49. *Apis zonata*, Sm. (nec. Guér.), Journ. Linn. Soc., iii, 1859, p. 8. *Apis dorsata*, Bingham, Proc. Zool. Soc. Lond.,

1896, p. 457; Faun. Brit. Ind. Hym., i, 1897, p. 557, pl. iv, fig. 11; Paiva, Rec. Ind. Mus., i, p. 17, 1907.

One specimen from Dibrugarh, N.E. Assam, 17—19-xi-11 (*Kemp*).

Recorded by Bingham from throughout India, Burma, Tenasserim, Ceylon, extending into China and the Malayan region to Java.

Represented in the Indian Museum collection from W. Himalayas:—Mussoorie, ca. 7,000 ft., 12-viii-05 (*Brunetti*); Kumaon; Simla, 7,000 ft., 7-v-10 (*Annandale*).

United Provinces:—Dehra Dun, base of W. Himalayas; Dhikala, Naini Tal district, 22-iv-08; Boxar, Naini Tal district, 19-iv-08; Gularbojh, Naini Tal district, 17—20-iv-08; Bareilly 15—22-iii-07; Lucknow, 5-xi-07; Meerut, 8—14-iii-07; Kaira, base of W. Himalayas, Naini Tal district, 24-iii-10; Bhogpur, Bijnor district, 2-iii-10; Amangarh, Bijnor district, 24-ii-10 (*Mus. collr.*).

Nepal frontier:—Thamaspur, 18—20-ii-08 (*Mus. collr.*).

E. Himalayas:—Sikhim.

Chota Nagpur:—Paresnath, 4,400 ft., 11-iv-09 (*Annandale*).

Bengal:—Murshidabad; Calcutta, 20-iii-07.

Assam:—Naga Hills; Sibsagar; Shillong; Margherita; Mazzbat, Mangaldai district, 11—15-x-10 (*Kemp*); Lushai Hills, 3,600 ft., 7-vi-04 (*E. C. MacLeod*).

Burma:—Base of Dawna Hills, 2-iii-08 (*Annandale*).

Bombay:—Belgaum.

Malay Archipelago:—Sinkep I.

Represented in the Pusa collection from Punjab:—Lahore; Wazirabad; Jamoo.

Central Provinces:—Bula; Hoshangabad; Itarsi.

Bihar:—Chupra.

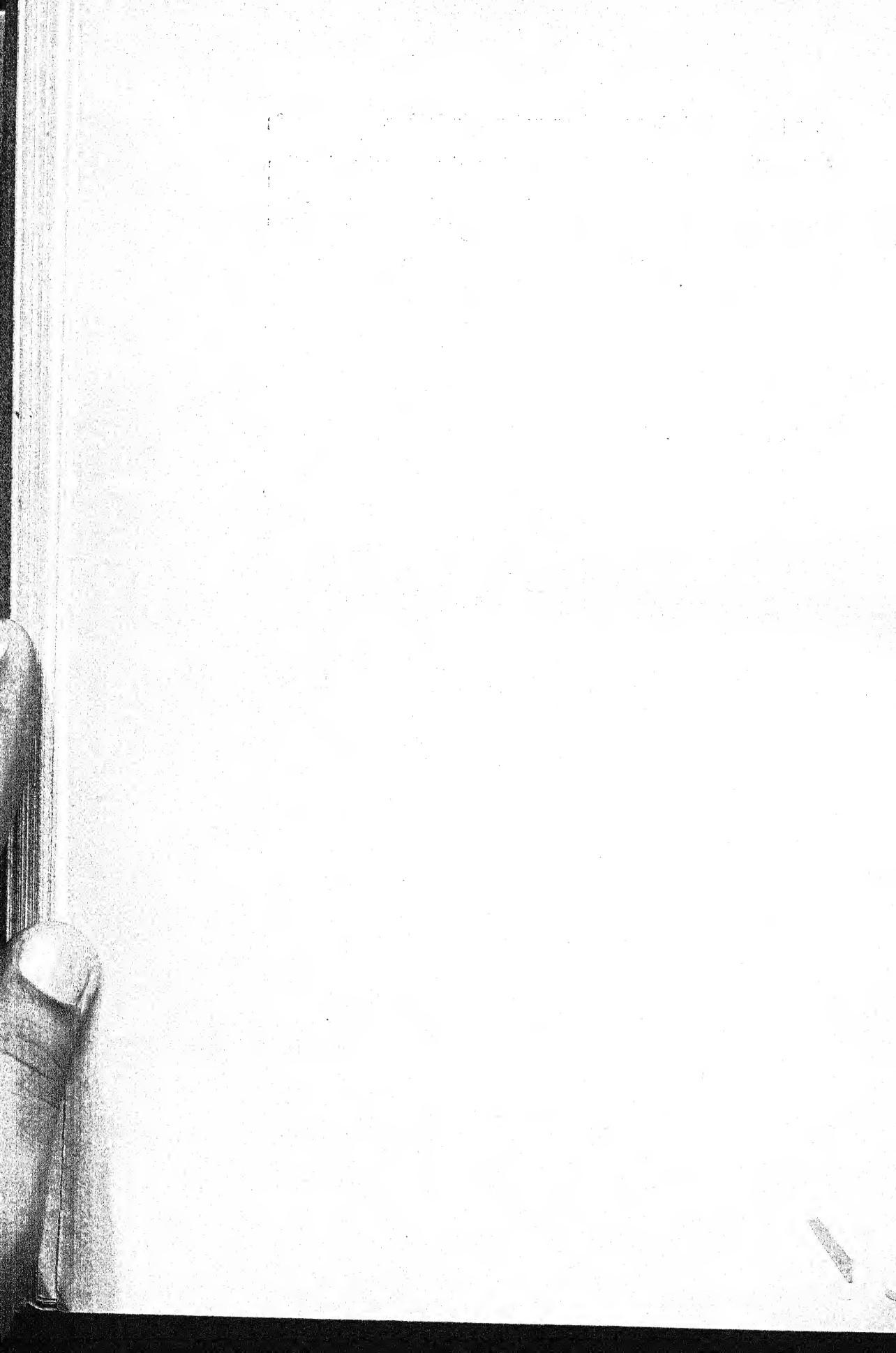
Bengal:—Rangpore.

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Culicidae and Corethridae in the Indian Museum. *Miscellanea* :—Measurements of the skeletons of two large Indian elephants in the Indian Museum. The young of *Aelurus fulgens*. Some Batrachia recently added to the collection of the Indian Museum. Breeding habits of *Tylocotriton verrucosus*. The occurrence of *Rhinodon typicus* at the head of the Bay of Bengal. Note on *Ephydatis meyenii* (Carter).

*Part IV.*—Aquatic animals from Tibet, I. Aculeate Hymenoptera in the Indian Museum, I. Indian Psychodidae. A new species of mouse from the Madura District, Madras. Some Cleridae of the Indian Museum. The Fauna of Brackish Ponds at Port Canning, Lower Bengal, XII. A new species of Saw-Fish captured off the Burma Coast. A new Sting Ray of the genus *Trygon* from the Bay of Bengal. New Microlepidoptera from India and Burma. Chrysomelid Beetles in the Indian Museum. Six new Cicindelinae from the Oriental Region. A new Slug from Tibet.

*Part V.*—Revision of the Oriental Leptidae. Revised and annotated Catalogue of Oriental Bombyliidae.

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*Part I.*—The races of Indian rats.

*Part II.*—Freshwater Sponges, X. Aquatic animals from Tibet, II. Some amphibious Cockroaches. Quelques nouvelles Cécidomyies des Indes. New land and marine shells from Ceylon and S. India. Two new species of *Caranx* from the Bay of Bengal. Some little known Indian Ophidia. Some forms of *Dipsadomorphus*. A pelagic Sea-Anemone without tentacles. Rhynchota Malayana, II.

*Part III.*—The Neuroptera in the Indian Museum. New Indian Leptidae and Bombyliidae. The Trichoptera in the Indian Museum. New species and varieties of Freshwater Crabs, I—3. Lizards from Travancore. Three new Cicindelinae from Borneo. The relation between fertility and normality in Rats. A Barnacle of the genus *Scalpellum* from Malaysia. The Hemipterous family Polycetenidae. Freshwater Sponges, XI. Two new shells from S. India. A new genus of Phylactolaematus Polyzoa. *Miscellanea* :—Major Wall on some forms of *Dipsadomorphus*. Notes on Indian Batrachia. Notes on Indian Freshwater Fish. Field notes on Indian Insects. The habits of Indian King-Crabs. The rate of growth in *Conchoderma* and *Lepas*. Large colonies of *Hislopia lacustris*. *Branchiocerianthus imperator* von der Küste von Oman und Baluchistan.

*Part IV.*—A minute Hymenopterous insect from Calcutta. The Insect Fauna of Tirhut, No. 1. New species of *Botia* and *Nemachilus*. New Oriental Sepsinae. A new species of *Fredericella* from Indian lakes. New species and varieties of freshwater crabs, 4. Some new or little known Mygalomorph spiders from the Oriental region and Australasia.

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No. I.—Second report on the collection of Culicidae in the Indian Museum.

Nos. II and III.—The Indian species of Papataci Fly (*Phlebotomus*). Taxonomic values in Culicidae.

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### Vol. V, 1910.

*Part I.*—The Hydroids of the Indian Museum, I. Freshwater Sponges, XII. New Shells in the Indian Museum from Burma, Siam and the Bay of Bengal. Materials for a revision of the Phylactolaematus Polyzoa of India. Studies on the aquatic Oligochaeta of the Punjab. An undescribed Burmese Frog allied to *Rana tigrina*. *Miscellanea* :—The occurrence of *Vultur monachus* in Calcutta. An albino Owl. “*Maila bengalensis*”: a correction.

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*Part I.*—A Rhizocephalous Crustacean from fresh water and on some specimens of the order from Indian seas. Decapoda in the Indian Museum, II. Contributions to the fauna of Yunnan. Parts II to V. Pedipalpi in the Indian Museum, I and II. Six new species of shells from Bengal and Madras. *Miscellanea*:—Fleas from India and China. Flies found associated with cattle in the neighbourhood of Calcutta. Mosquito sucked by a midge. Large egg laid by a beetle.

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### Vol. VII, 1912.

*Part I.*—Deep-sea Fish obtained by the R.I.M.S.S. "Investigator" during 1910-11. Decapoda in the Indian Museum, III. Fauna of Paresnath Hill. Observations on the shallow-water Fauna of the Bay of Bengal made on the "Golden Crown," 1908-09. Coccidae in the Indian Museum, I. On the nervous system of *Ampullaria globosa*. Description of a species of Phoridae that causes Myiasis in man. *Miscellanea*:—Mimicry of a Mutiliid by a spider. Capture of *Limulus* on the surface. Development of the larva of *Lingula*. Distribution of some Indian and Burmese Lizards.

*Part II.*—The Mosquitoes of Calcutta. Freshwater sponges, XIV. Pedipalpi in the Indian Museum collection, III and IV. New Freshwater Crab from S. India. Decapoda in the Indian Museum, IV. Fauna Symbiotica Indica, I and II. Invertebrate Fauna of the Kumaon Lakes. Fauna Symbiotica Indica, III. The Indian Mud-Turtles. Anatomy of *Atopos sanguinolenta*. Cestodes from Indian Fishes. *Miscellanea*:—Entoprocta in Indian Waters. Rearing of Leeches in Bara Banki District. Habits of Tiger-Beetles. *Schizodactylus monstrosus* as bait for birds. *Macrones menoda* var. *trachacanthus*. Aquatic Tortoises of the Ganges and Brahmaputra.

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